INTERNATIONAL FOOD INFORMATION SERVICE

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FAB 17

MICROBIAL TOXINS IN FOODS

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INTRODUCTION

Food Annotated Bibliographies (FABs) are collections of abstracts on specific topics in food science and technology. The topics are chosen by the staff of the International Food Information Service as being of particular interest or importance. The topics normally interest individual workers, who may not require the full information provided in Food Science and Technology Abstracts, from which the abstracts for FABs are taken. The size and the cost of the FABs are controlled as much as possible with the interests of individual workers in mind.

Titles of the FABs now available are given on the back cover of this booklet. For up-to-date lists of FABs or suggestions for new topics please write to the address on the back cover. New subjects are searched for at least the five most recent volumes of Food Science and Technology Abstracts. Thereafter each FAB is updated monthly. Copies of each months abstracts on any topic may be obtained as indicated on the back cover of this publication. At the end of each volume of up-dating, the abstracts are merged and made available as a separate supplement to the original FAB.

Some of the larger FABs have been divided into sections to facilitate use. FAB 47 also has a subject and author index provided.

Copies of all original articles referred to in the abstracts may be bought (or occasionally borrowed) from the International Food Information Service. A form for ordering these is provided at the end of this FAB.

Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journals, patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would, in any case, encourage readers to write or telephone us with any comments or queries that they may have.

H. BROOKES

EDITOR

1

Double antibody solid-phase radioimmuno-assay for staphylococcal enterotoxin A.
Lindroth, S.; Niskanen, A.
European Journal of Applied Microbiology 4 (2) 137–143 (1977) [21 ref. En] [Techn. Res. Cent. of Finland, Food Res. Lab., Biologinkuja 1, SF-02150 Espoo 15, Finland]

A double antibody solid-phase (DASP) radioimmunoassay for staphylococcal enterotoxin A is described. In the assay the antigen-antibody complex is precipitated by anti-rabbit serum which is adsorbed onto a solid carrier (cellulose). The method is sensitive to 200 pg of enterotoxin. It was possible to detect as little as 2–5 ng enterotoxin A/ml food extract from minced meat and sausage. Enterotoxins B and C were not found to inhibit the uptake of labelled enterotoxin A at a level which might distort the results of the enterotoxin A assay. The DASP technique is sensitive, rapid, and easy to perform and thus compares favourably with other radioimmunoassays for enterotoxin. AS

2

Occurrence of Bacillus cereus and the bacteriological quality of Chinese 'take-out' foods.
Schiemann, D. A.
Journal of Food Protection 41 (6) 450–454 (1978) [22 ref. En] [Ontario Min. of Health, Box 9000 Terminal A, Toronto, Ontario M5W 1R5, Canada]

165 samples of various foods (including meat, vegetables, rice and shrimps) were collected from 24 different Chinese take-away restaurants for bacteriological examination which included enumeration of Bacillus cereus by 3 media, MYP, KG and blood agars. Blood agar was less selective but no quantitative differences in recovery were apparent. 28 samples (15%) yielded B. cereus at >100/g, and 20 of these were fried rice (33% positive), which also showed the poorest overall bacteriological quality. Biochemical characterization of 232 isolates of B. cereus showed $\geq 96\%$ positive for catalase, nitrate reduction, beta-haemolysis, subterminal-ellipsoidal spores, aerobic and anaerobic utilization of glucose, Voges-Proskauer, fermentation of glycerol, gelatin hydrolysis, and alkaline peptonization of litmus milk; and a negative reaction in mannitol. Variable results were obtained for motility, fermentation of sucrose and salicin, and starch hydrolysis. 33 isolates were susceptible to 12 of 19 antibiotics tested, and resistant to colistin. 6 (18%) were susceptible to penicillin. AS

3

[Current trends in the study of enterotoxic staphylococci.] [Review]
Wittlin, E.
Medycyna Weterynaryjna 33 (11) 651–653 (1977) [29 ref. Pl] [Samodzielna Pracownia Mikrobiol. i Biochem. Produktow Zwierzecych, Inst. Weterynarii w Pulawach, Warsaw, Poland]

It is pointed out in this review that according to statistics for 1971–1973, staphylococci were in Poland 2nd only to salmonellae as food-poisoning agents. Enterotoxin production by staphylococci is reviewed, with particular reference to Staphylococcus aureus, and effects of heat treatment of foods and interaction with other microorganisms are considered. SKK

4

Detection of staphylococcal enterotoxin B by affinity radioimmunoassay.
Niyomvit, N.; Stevenson, K. E.; McFeeters, R. F.
Journal of Food Science 43 (3) 735–739 (1978) [19 ref. En] [Dep. of Food Sci. & Human Nutr., Michigan State Univ., East Lansing, Michigan 48824, USA]

A rapid, sensitive method for detection and quantitation of staphylococcal enterotoxin B (SEB) was developed. Antibody to SEB was covalently attached to Sepharose 4B by use of cyanogen bromide activation. The antibody gel was diluted with Sephadex G-25, and 1–2 ml packed vol. of the diluted gel was placed in a small column. Assays were carried out by sequentially pumping sample, ^{125}I-labelled SEB, 0.05M sodium phosphate buffer (pH 7.5) containing 0.15M NaCl, and 0.13M NH_4OH (pH 10.5) containing 0.15M NaCl through the column. The amount of ^{125}I-labelled SEB removed from the column with the pH 10.5 solution was inversely related to the amount of SEB in the sample. After washing with the pH 7.5 buffer, the column was ready to reuse. Columns were used for >100 detn. The min. SEB concn. which could be detected were 1.2 ng/ml in buffer, 2.2 ng/ml in dried skim-milk and 6.3 ng/g in hamburger. This affinity radioimmunoassay was also suitable for measuring thermal inactivation of SEB, and can be used for rapid detection of SEB. IFT

5

Staphylococcal enterotoxin A and C production with various sugars as energy source.
Woodburn, M. J.; Morita, T. N.; Rowe, K.; Park, S. S.
Journal of Food Protection 41 (8) 643–646 (1978) [16 ref. En] [Dep. of Food and Nutr. and Statistics, Oregon State Univ., Corvallis, Oregon 97331, USA]

1% added sugar (sucrose, maltose, lactose, glucose and glucose + fructose) to casein hydrolysate (NAK) medium with or without starch or low methoxyl pectin did not significantly affect enterotoxin C production but did significantly decrease the pH at 12 and 24 h. The increased viscosity of colloidally thickened media resulted in decreased aeration in shaken cultures and decreased quantities of enterotoxin C. Sugars tested did not differ practically in their effects on the parameters of multiplying Staphylococcus aureus 361 and 265-1 which were measured. Addition of 1% of glucose, sucrose, or maltose prevented the decreased growth rate observed when strain 265-1 was grown in 20% O_2 + 80% N_2 instead of air. AS

6

Use of molasses medium for toxin production by Clostridium botulinum type A.
Silva, H.; Rigo, G. de; Ertola, R.
European Journal of Applied Microbiology 4 (3) 239–241 (1977) [6 ref. En] [Catedra de Microbiol. General, Univ. Nacional de San Luis, Chacabuco y Pedernera, San Luis, Argentina]

The preliminary results obtained with a molasses medium for toxin production by C. botulinum Type A are reported. Several media containing different amounts of proteose peptone, glucose and cysteine hydrochloride with and without additions of yeast extract were tested and compared with other media containing proteose peptone and molasses. 2 media: proteose peptone, glucose, yeast extract and cysteine hydrochloride; and proteose peptone and blackstrap molasses, were selected for further tests on the basis of the toxigenic activities. The media were inoculated with C. botulinum, and toxigenic activity was determined by intraperitoneal injections of supernatant to mice, after 24, 36, 48, 60 and 72 h incubation. Results of toxigenic activities are reported in tables. From the results it was concluded that blackstrap molasses can replace glucose, yeast extract and cysteine hydrochloride in a rich medium used for toxin production by C. botulinum, and can be a suitable and inexpensive component of such media. SP

7

Receptors and recognition. Series B Vol. I. The specificity and action of action of animal, bacterial and plant toxins. [Book]
Cuatrecasas, P. (Editor)
ix + 345pp. ISBN: 0-412-09730-3 (1977) [many ref. En]
London, UK; Chapman & Hall Ltd. [Wellcome Res. Lab., Research Triangle Park, North Carolina, USA]

This first volume in the Receptors and Recognition series deals with the specificity and action of animal, bacterial and plant toxins. Chapters include: Cholera toxin: membrane gangliosides and activation of adenylate cyclase, by V. Bennett & P. Cuatrecasas (pp. 1-66, many ref.); Inhibition of protein synthesis by exotoxins from Corynebacterium diphtheriae and Pseudomonas aeruginosa, by R. J. Collier (pp. 67-98, 82 ref.); Abrin, ricin and their associated agglutinins, by S. Olsnes & A. Pihl (pp. 128-173, 185 ref.); Cell membranes and cytolytic bacterial toxins, by J. E. Alouf (pp.219-270, many ref.); Presynaptic actions of botulinum toxin and β-bungarotoxin, by L. L. Simpson (pp. 271-295, many ref.); and Steroidal alkaloid toxins and ion transport in electrogenic membranes, by E. X. Albuquerque & J. Daly (pp. 297-338, 65 ref.). A 7pp. subject index is also given. SP

8

[Influence of changed eating habits on the occurrence of bacterial food poisoning.] Der Einfluss veränderter Ernährungsgewohnheiten auf das Vorkommen von bakteriellen Lebensmittelvergiftungen. [Review]
Uzelac, G.; Propach, S.
Ernährungs-Umschau 24 (10) 323-328; 322 (1977) [23 ref. De, en] [Inst. für Pflanzenkrankheiten, Univ. of Bonn, Bonn, Federal Republic of Germany]

As recent statistical evidence indicates a rise in the frequency of bacterial food poisoning, a literature review was undertaken to investigate the causes. Bacterial agents of food poisoning cases are tabulated, with the relevant ref., to show examples of pathogenic bacteria in institutional catering, prepared foods, and imported foods, all of which are seen as aspects of changes in eating habits. DIH

9

[Types of enterotoxins produced by staphylococci isolated from cows' milk.]
Butkus, K. D.; Bugrova, V. I.; Gasanov, N. G.; Fluer, F. S.
Voprosy Pitaniya No. 3, 86-88 (1978) [3 ref. Ru, en] [Vses. Nauchno-Issled. Inst. Maslodel'noi i Syrodel'noi Promyshlennosti, Kaunas, USSR]

97 staphylococcal strains were isolated from 500 milk samples from mastitic cows, 250 bulk milk samples from different Lithuanian dairies, 100 milk samples intended for Rossiiskii cheese manufacture, and 100 samples of the final cheese. Of the 97 strains, 84 (most of which were DNAase-positive) coagulated plasma, and 88 (mostly isolated from mastitic cows' milk) produced α- and/or β-haemolysins. The staphylococci were especially sensitive to neomycin, monomycin and erythromycin, but resistant to streptomycin, tetracycline, levomycetin and (to some extent) penicillin. All staphylococci survived milk pasteurization at 70° C with 20 s holding, but were destroyed by pasteurization at 80°, 85° or 90° C; a few survived pasteurization at 75° C, but these are not considered to present a serious risk of enterotoxin production in cheese. The ability to produce enterotoxins was investigated in 28 pathogenic strains isolated from the mastitic cows' milk; 13 of these strains produced enterotoxin type B, 1 produced type A, and 3 produced both. Of 12 strains isolated from pasteurized milk products and from bulk milk, 7 produced enterotoxin type A, 2 produced types A and B, and 3 could not be typed. It is pointed out that most cases of staphylococcal food poisoning are due to enterotoxin type A, probably because it is produced over a wider temp. range (6.8-45° C) than other enterotoxins. ADL

10

Effect of nitrite, storage temperature and time on Clostridium botulinum type A toxin formation in liver sausage.
Ala-Huikku, K.; Nurmi, E.; Pajulahti, H.; Raevuori, M.
European Journal of Applied Microbiology and Biotechnology 4 (2) 145-149 (1977) [16 ref. En] [State Vet. Med. Inst., Hämeentie 57, 00550 Helsinki 55, Finland]

The occurrence of Clostridium botulinum type A toxin in inoculated, commercially processed Finnish liver sausages that were kept under different storage conditions was studied. 2 levels (0 and 100 mg/kg) of sodium nitrite addition, 3 different storage times (93, 6 and 14 days) and 3 temp. (15°, 20° and 25° C) were used. An addition of 100 mg of sodium nitrite/kg of sausage emulsion prevented toxin formation during a 2-wk period. In an inoculated sausage without nitrite the toxin was not produced when stored at 15° C, but was formed at 20 and 25° C. AS

11

Biochemical differences of pigmented Staphylococcus aureus strains and their non pigmented derivatives. [Lecture]
Yokoya, F.; Salzberg, S. P.
International Congress of Food Science & Technology - Abstracts p.241 (1978) [En] [Dep. of Food Sci., FEA UNICAMP, 13100 Campinas, Sao Paulo, Brazil]

A study was made of the biochemical properties of 5 pigmented Staph. aureus strains and their non-pigmented variants. Pigmented strains plated after storage for 6 months spontaneously produced non-pigmented variants. The pigmented and non-pigmented strains differed in their capacities to produce enterotoxins. [See FSTA (1979) 11 2A60.] JA

12

Suitability of enzyme treatment and ammonium sulfate precipitation method for detection of staphylococcal enterotoxin from different foods.
Niskanen, A.; Lindroth, S.
European Journal of Applied Microbiology 4 (3) 233–237 (1977) [11 ref. En] [Food Res. Lab., Tech. Res. Cent. of Finland, Biologinkuja 1, SF-02150 Espoo 15, Finland]

An enzyme treatment and $(NH_4)_2SO_4$ precipitation procedure was adapted to the detection of staphylococcal enterotoxin from high-protein foods. The enterotoxin is extracted from food with distilled water, soluble proteins are acid-precipitated (pH 4.5) and the supernatant washed with chloroform (pH 7.5). The extract is treated with trypsin and Pseudomonas peptidase for 2 h at 37° C. Residual unhydrolysed material is precipitated with 60% $(NH_4)_2SO_4$ for 15 min at 4° C. The precipitate is redissolved in phosphate buffer and concentrated by dialysis against polyethyleneglycol. The concentrate is washed with chloroform and lyophilized. The dry material is dissolved in 0.2 ml distilled water and enterotoxin detected by the micro-slide method with 24 h incubation at 37° C. Using this method, it was possible within 3 days to detect 0.2–1.0 μg staphylococcal enterotoxin A added to minced meat, dry sausage, smoked fish, cheese and milk. AS

13

Botulism in infants: a cause of sudden death?
Marx, J. L.
Science, USA 201 (4358) 799–801 (1978) [En]

The possibility that botulism in infants is an infectious disease, perhaps being a cause of sudden infant death syndrome, is discussed. Because Clostridium botulinum spores are so common in the environment little can be done to protect infants from them. However, honey should not be given to infants under 1 yr old. It is reported that botulinum spores were identified in 10–15% of honey samples tested by California investigators, and that 30% of infants hospitalized in California had been fed honey before they became ill, but of 10 deaths linked to C. botulinum none of the victims had eaten any honey. AL

14

[Foodstuffs as a source of toxic compounds.]
Pyysalo, H.
Kemia-Kemi 5 (9) 377–379 (1978) [11 ref. Fi, en]

Although there are frequent cases of food-borne illness the number of serious cases in Finland/yr is very low. Most of the cases result from pathogenic bacteria. The most important enterotoxins in Finland are thought to be produced by Staphylococcus aureus, Clostridium perfringens and Bacillus cereus. The chief mycotoxins are aflatoxins and patulin. The most important pollutants in the Finnish diet are heavy metals, chlorinated phenols and polychlorinated biphenyls. The level of pesticides residues in Finnish foodstuffs is low. In this paper a short survey is made of the harmful compounds potentially present in foodstuffs. AS

15

Immunological aspect of Clostridium perfringens food poisoning. [Lecture]
Skjelkvale, R.; Uemura, T.
International Congress of Food Science & Technology - Abstracts p.261 (1978) [En] [Norwegian Food Res. Inst., N-1432 As-NLH, Norway]

The immunological response in man and animals to the enterotoxin of Cl. perfringens was studied. The passive haemagglutination titre started to increase shortly after exposure to the toxin and reached 2400 after 17 days. Orally administered toxin was detected in faeces but not in serum. Binding studies indicated that the toxin is bound to the intestinal mucosa. [See FSTA (1979) 11 2A60.] JA

16

[Food poisoning caused by bacteria and viruses. Epidemiological aspects.]
Böttiger, M.; Romanus, V.
Var Föda 30 (1) 7–22 (1978) [14 ref. Sv] [Epidemiologiska Avdelningen, Statens Bakteriologiska Lab., Stockholm, Sweden]

Epidemiological aspects of microbial food poisoning and other food- or water-borne diseases are discussed with reference to: definition of food poisoning, and its classification into infections, intoxications and intermediate types; a listing of the main types of food poisoning and food-borne diseases; incidence in Sweden; symptoms and epidemiology of major food-borne diseases; exotic food-borne diseases; direct and indirect costs of food-borne diseases; and legal aspects in Sweden. AJDW

17

Studies on the regulation of staphylococcal enterotoxins A and B produced by strain S-6. [Lecture]
Pereira, J. L.; Salzberg, S. P.
International Congress of Food Science & Technology - Abstracts p.260 (1978) [En] [Dep. of Food Sci., FEA, UNICAMP, 13100 Campinas, Sao Paulo, Brazil]

A study was made of toxin production by Staphylococcus aureus (strain S-6) grown in a casein hydrolysate medium (enriched with thiamine and niacin) at temp. of 20–45° C, pH of 4.5–9.0 and in the presence of 0–12% NaCl. Max. enterotoxin production occurred at 39.5° C and pH 7.0 and with 0% NaCl. [See FSTA (1979) 11 2A60.] JA

18

Occurrence of enterotoxigenic staphylococci, especially producers of enterotoxins D and E among strains isolated from food.
Windyga, B.
Acta Alimentaria Polonica 4 (2) 129–132 (1978) [11 ref. En, pl] [Państwowy Zakład Higieny, Warsaw, Poland]

Of 289 Staph. aureus strains investigated, 105 (36.5%) produced enterotoxins. Of the 77 strains isolated from incidents of food poisoning, 53 (68.8%) were enterotoxigenic, with enterotoxin D alone produced by 7 strains, E by 2, A + D by 11 and A + C + D by 3 strains. Of the 212 strains isolated from various foods during routine examination, 53 (24.5%) appeared to be enterotoxigenic, with enterotoxin D alone produced by 5 strains, E by none, A + D by 9 and A + C + D by 1 strain. AL

19

[Food poisoning caused by bacterial toxins.]
Danielsson, M.-L.; Wadström, T.
Var Föda 30 (1) 23–30 (1978) [10 ref. Sv] [Inst. för Livsmedelshygien, Veterinärhögskolan, Stockholm, Sweden]

Food poisoning by microbial toxins is discussed with reference to: the chemical nature and heat resistance of mycotoxins; the mechanism of action of bacterial toxins; characteristics of and tests for toxins of Staphylococcus aureus, Clostridium perfringens, Bacillus cereus, Vibrio spp. and Escherichia coli; botulism; symptoms of poisoning with toxins of Bacillus cereus, Clostridium perfringens and Staphylococcus aureus; toxigenic Vibrio spp. in fish and shellfish; and toxigenic strains of Escherichia coli. AJDW

20

[Aspects of medical interest concerning mushrooms.] [Lecture]
Vigne, J.; Gounelle de Pontanel, H.
Medecine et Nutrition 14 (2) 131–135 (1978) [22 ref. Fr] [Cent. de Recherches Foch, 4 Rue de l'Observatoire, 75006 Paris, France]

Aspects considered include: the capacity of fungi to accumulate heavy metals from their substrate, with consequent relatively high heavy metal concn. in the edible parts; bacterial contamination; the risk of botulism from canned or bottled mushrooms; and the potential for growth of Clostridium botulinum in fresh mushrooms in gas-tight plastics packs. [See FSTA (1979) 11 2J266.] AJDW

21

[Sources of contamination of cheese with pathogenic staphylococci during manufacture.]
Sveshnikova, I. G.; Keropian, E. A.; Korotyaev, A. I.
Gigiena i Sanitariya No. 4, 30–32 (1978) [Ru, en] [Kubanskii Med. Inst., Krasnodar, USSR]

A study was made to identify sources of contamination of Rossiiskii cheese with pathogenic staphylococci, as well as factors favouring staphylococcal growth during the manufacturing process. Styphylococci were detected in 236 out of 300 raw milk samples supplied to the cheese factories, and coagulase-positive staphylococci were detected in 151 samples. 22 out of 45 dairy farm workers and 35 out of 95 cheese factory workers examined were carriers of coagulase-positive staphylococci. Of 120 milk samples taken after pasteurization (74° C, 15 s), 10 contained staphylococci. Tests on 54 milk samples for antibiotics, before and after pasteurization, gave positive results in 7 cases. A comparative cheesemaking experiment, using 20 batches of milk containing antibiotics and 20 batches free from antibiotics, revealed that the antibiotics inhibited Streptococcus lactis and consequently favoured the growth of Staphylococcus aureus, especially during pressing. 894 staphylococcal strains isolated from workers and from cheese samples during manufacture included 672 coagulase-positive strains, of which 657 produced haemotoxin and 253 lecithinase. The Staph. aureus cultures were fairly sensitive to erythromycin, oleandomycin, chloramphenicol, neomycin and monomycin, but not to penicillin or tetracycline. As a rule, the staphylococci isolated from a particular production batch were all sensitive to the same phages, indicating a common source. The phage typing suggested that the staphylococci in the cheese were of both animal and human origin. ADL

22

[Experimental study of the growth of pathogenic staphylococci and the time needed for enterotoxin formation during manufacture and ripening of Rossiiskii cheese.]
Bugrova, V. I.; Butkus, K. D.
Voprosy Pitaniya No. 4, 77–79 (1978) [2 ref. Ru, en] [Lab. Sanitarno-Pishchevoi Mikrobiol., Inst. Pitaniya AMN SSSR, Moscow, USSR]

In 4 series of experiments, Rossiiskii cheese was made from milk which after pasteurization was deliberately contaminated with $\leq 10^7$ staphylococci/ml. Staphylococci of bovine phage types showed more active growth during cheese ripening than staphylococci of phage types belonging to the international set. When low doses of staphylococci (1–1.5 million/ml) were used to contaminate the milk, the staphylococci grew rapidly during cheese manufacture, reaching a max. level after pressing, but then died off during ripening (especially in the 1st 15 days). Staphylococcal enterotoxin A persisted in the cheese for 2½ months or more if the milk was contaminated with a high dose (10^7/ml) of staphylococci of a bovine phage type. The enterotoxin persisted even longer ($\geq 3½$ months) if the milk was held for 18 h at 25° C after addition of the staphylococci and before cheesemaking. ADL

23

Surveys on the occurrence of Clostridium botulinum in fresh Baltic herrings.
Zaleski, S.; Daczkowska, E.; Fik, A.; Jozwiak, A.
Acta Alimentaria Polonica 4 (2) 159–162 (1978) [15 ref. En, pl] [Inst. Tech. Zywnosci Pochodzenia Morskiego, AR, Szczecin, Poland]

Of 152 herrings caught in the Southern Baltic Sea between Nov. 1975 and May 1976, the intestines of 30 of them were positive for Clostridium botulinum. 28 were positive for type E toxin and 2 for type A toxin. The % of positive results ranged from 4 to 50%, depending on the batches of fish tested. AL

24

Low-acid canned food regulations. [Lecture]
Schaffner, R.; Mulavaney, T.; Pretanick, S.
International Congress of Food Science & Technology - Abstracts p.122 (1978) [En] [Bureau of Foods, FDA, 200 C Street, SW, Washington, DC 20204, USA]

Since 1900 there have only been 55 outbreaks of botulism from commercial canned low-acid foods in USA, but 2 outbreaks in 1971 attracted adverse publicity which led to a Good Manufacturing Practice regulation (GMP). Since 1973 over 3000 inspections have covered 1000 establishments and 5000 imports have been examined. Between 1973 and 1977 the % of plants complying with GMP rose from 71 to 88% and serious deficiencies fell from 16 to 3% of plants. Common failings are discussed. [See FSTA (1979) **11** 2A60.] ELC

25

Influence of para-hydroxybenzoic acid esters on the growth and toxin production of Clostridium botulinum 10755A.
Robach, M. C.; Pierson, M. D.
Journal of Food Science 43 (3) 787–789, 792 (1978) [24 ref. En] [Dep. of Food Sci., Virginia Polytech. Inst. & State Univ., Blacksburg, Virginia 24061, USA]

The effect of the methyl and propyl esters of p-hydroxybenzoic acid (paraben) on growth and toxin formation by C. botulinum 10755A spores was studied. Pre-reduced anaerobically sterilized media and strict anaerobic techniques were employed. The addition of 200 p.p.m. propylparaben to a thiotone-yeast extract-glucose (TYG) growth medium inhibited germination and toxin production of C. botulinum 10755A for $\leq$120 h at 37° C. Growth and toxin production were delayed when 100 p.p.m. propylparaben was added to TYG. When 1200 p.p.m. of methylparaben was added to TYG, germination and toxin production were inhibited, while 1000 p.p.m. delayed growth and toxin production, and 400 p.p.m. slightly delayed growth and toxin production. IFT

26

Effect of nitrogen source on growth and exoprotease production by Clostridium perfringens.
Blaschek, H. P.; Solberg, M.
Journal of Food Science 43 (4) 1253–1256 (1978) [22 ref. En] [Dep. of Food Sci., Rutgers State Univ., New Brunswick, New Jersey 08903, USA]

16 strains of Clostridium perfringens were screened for their growth and exoprotease activity in a synthetic amino acid medium and in media containing either vitamin-free casein, spray-dried whole egg or ground frankfurter as the protein source. Growth, measured by gas production, was determined manometrically under standard conditions. Quantitative enzymic assay of sterile culture filtrates was carried out at pH 7.0 using Azocoll general proteolytic substrate. Strains grown in protein-containing media usually produced more exoprotease/unit of growth than strains grown in synthetic amino acid medium. Strains which constitutively produce high levels of exoprotease were identified. IFT

27

Detection of staphylococcal enterotoxins A, B, C, D, and E in foods by radioimmunoassay, using staphylococcal cells containing protein A as immunoadsorbent.
Miller, B. A.; Reiser, R. F.; Bergdoll, M. S.
Applied and Environmental Microbiology 36 (3) 421–426 (1978) [24 ref. En] [Food Res. Inst., Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

A sensitive radioimmunoassay utilizing Staphylococcus aureus cells containing protein A as a coprecipitant is described for the detection and assay of staphylococcal enterotoxins A, B, C, D and E in a variety of foods (liquid and evaporated milks, ham, sausage, raw dough, soy protein, lobster bisque, cheese, hard boiled egg). Solid foods were homogenized with 1.5 ml water/g at pH 4.5, centrifuged at 20 200 $\times$ g_n for 20 min at 4° C and the supernatant fluid adjusted to pH 7.5. Chloroform (1 ml/10 ml extract) was added and the sample stirred for 3–5 min, centrifuged as described above and filtered through Miracloth before analysing. A logit-log plot for the standard curve of the inhibition of ^{125}I-labelled staphylococcal enterotoxin A (SEA) uptake by unlabelled SEA gave a linear response over the range 0.3–10.0 ng enterotoxin. Recovery of SEA added to liquid milk was satisfactory but some difficulties were experienced with ham, sausage and raw dough. However, even with these foods it was possible to detect 1 ng enterotoxin/g. An enterotoxin analysis can be made in 1 working day once the labelled enterotoxins are available. MEG

28

Accent on sanitation – a dialogue on quality and profit.
Anon.
Food in Canada 38 (1) 15–16, 18–20 (1978) [En]

Sources of food-borne illnesses in Canada are reviewed, and the need for a properly controlled sanitation programme in the food industry is emphasized. A practical list of "Do's and don'ts of sanitation", designed as a checklist for compiling or revising a plant's sanitation programme, is included. Tabulated data compare the types of foods involved in food poisoning cases in Canada (1973) and the USA (1971). Total outbreaks were 194 and 320, resp., with meat (40.7%), poultry (12.4%), Chinese foods (10.3%) and unknown (10.3%) the main causes in Canada, and meat (30.6%), unknown (22.8%) and relatively esoteric foods (15.3%) the main causes in the USA. The Canadian outbreaks are analysed by causal agent: the 194 outbreaks produced 1718 cases, in which Staphylococcus aureus (567), Clostridium perfringens (494), Salmonella (102) and unknown origins (503) made up the bulk. HBr

29

Characterization of the genetic determinants of the staphylococcal enterotoxins A and B.
Shaper, W. M.; Landolo, J. J.
Abstracts of the Annual Meeting of the American Society for Microbiology 78, 189 (1978) [En] [Div. of Biol., Kansas State Univ., Manhattan, Kansas 66506, USA]

The genetic determinants of the staphylococcal enterotoxins A and B (SEA, SEB) were investigated in several food poisoning isolates that produced either a single serotype or both serotypes. Plasmid loci were evaluated by marker analysis of plasmids in transductants obtained with phage grown on the toxigenic strains, in transformants obtained with plasmid DNA of toxigenic strains and by analysis of cured test strains. These data were confirmed by physical analysis of the plasmid make-up of the host and recipient strains by dye-buoyant density and neutral sucrose gradient centrifugation. Each of the toxigenic host strains contained ≤ 2 plasmids but on transfer of these none of the recipients analysed produced either SEA or SEB and therefore toxigenicity could not be ascribed to a plasmid gene. Growth of the toxigenic strains in curing agents such as ethidium bromide, acridine orange, SDS or at 43° C was unsuccessful in curing the toxin phenotype but successfully eliminated all antibiotic resistant plasmids, except tetracycline resistance. This plasmid was analysed by transformation and also found to be negative regarding toxigenicity. All the strains examined were concluded to contain chromosomal determinants of enterotoxins A and B. AS

30

Antibody production and antigenicity of heat altered staphylococcal enterotoxin.
Bennett, R. W.
Abstracts of the Annual Meeting of the American Society for Microbiology 78, 189 (1978) [En] [FDA, Washington, DC, USA]

Antibodies (Ab) to staphylococcal enterotoxin A (SEA) were produced in rabbits to develop a serological test for the detection of heat altered (Δ) toxins. 1 mg samples of SEA in 2.0% gelatin were heated in sealed tubes for 39.6, 57.9 and 60 min at 250° F. Rabbits were injected subcutaneously, at weekly intervals, with gradually increasing doses (1.25–1000 μg) of Δ toxin. The antigenicity of Δ toxin was compared with that of native (unheated) toxin by immunizing the same rabbits with both forms and amounts of toxin. Δ toxin produced antibodies over an Ab titre range of 1:20–1:80 when directed against Δ toxin, compared with Ab titres ranging from 1:640 to 1:1280 produced by the native form of the toxin determined with unheated toxin. While antibody to Δ altered toxin could be produced, it is apparent that the antigenicity of Δ toxin is much lower than native toxin on injecting rabbits subcutaneously. The production of antibodies to Δ altered toxin offers a possible approach to the successful serological detection of Δ staphylococcal enterotoxin in canned foods which may not be detected by antibodies produced by the native form of the enterotoxin. AS

31

Influence of certain food preservatives on growth and production of enterotoxins by Staphylococcus aureus.
Mclver, R.; Noren, P.; Tatini, S. R.
Abstracts of the Annual Meeting of the American Society for Microbiology 78, 187 (1978) [En] [Univ. of Minnesota, St Paul, Minnesota 55108, USA]

Staphylococcus aureus (Z88) was grown in Brain Heart Infusion broth containing propylene glycol, butylene glycol, methyl parabenzoate, propyl parabenzoate, or butyl parabenzoate at levels permitted in foods. Incubation was at 37° C with shaking (280 rev/min). S. aureus population on trypticase soy agar and enterotoxins by microslide immuno-diffusion were determined after the stationary phase was reached. S. aureus grew slower and reached a 10× lower max. population in the presence of each of the preservatives; $6–8 \times 10^8$/ml vs. 5×10^9/ml in the control. The amount of extracellular enterotoxin A or D in the spent medium was higher in the control medium as a result of higher max. population; 0.9 μg A toxin/ml in the control vs. 0.09 μg/ml in propylene glycol, 0.15 μg/ml in butylene glycol and 0.2 μg/ml in methyl or propyl parabenzoate. However, the amount of intracellular enterotoxin A/cell was substantially higher (10×) in cells grown in propylene glycol or butylene glycol. Enterotoxin D also followed a similar pattern. Cells grown in the presence of these preservatives showed reduced synthesis of enterotoxin with accumulation of higher levels of intracellular enterotoxin. AS

32

Modification of casein hydrolysate medium for enterotoxin production by Staphylococcus aureus.
Patterson, J. E.; Morita, T. N.; Woodburn, M. J.
Abstracts of the Annual Meeting of the American Society for Microbiology 78, 187 (1978) [En] [Oregon State Univ., Cornvallis, Oregon 97331, USA]

With the cessation of availability of Protein Hydrolysate Powder (Mead Johnson International, Evansville, Indiana, USA), an alternative medium approach was needed for consistency in support of enterotoxin production by S. aureus, especially strains producing type B enterotoxin. Media prepared with different lots of N-Z Amine NAK (Humko-Sheffield Co., Norwich, New York) were used to investigate the roles of minerals, selected amino acids, and pretreatment with C. Enterotoxin, pH, and colony forming units were determined for both shaken and still cultures of 2 strains. Effectiveness of pretreatment of NAK with C, which has also been demonstrated for pepticase used in Clostridium botulinum toxin production, indicated that 1 function of effective ingredients may be interaction with toxic solutes. The addition of salts of Fe and Mg was also demonstrated to be beneficial. These 2 ions are among those found to be essential in the defined media that have been reported. Using either approach, variability in media quality which has been a practical problem, may be reduced. AS

33

Staphylococcal enterotoxin and nuclease production in foams.
Woodburn, M. J.; Morita, T. N.
Journal of Food Science 43 (5) 1628–1629 (1978) [8 ref. En] [Dep. of Foods & Nutr., Oregon State Univ., Corvallis, Oregon 97331, USA]

Air was incorporated into culture media by the addition of cellulose or nonabsorbent cotton pads to cornstarch pastes and by foam formation in an agar gel. Production of staphylococcal enterotoxin types A, B and C during incubation at 37° C was increased both on a /ml basis and /10^6 colony forming units by such air incorporation, but not in deaerated controls. Nuclease production followed the same trend. Cell numbers were less affected. Even limited inclusion of air within a food system thus increases the rate of staphylococcal production of enterotoxin. IFT

34

Enterotoxin secretion by Staphylococcus aureus grown on a gel surface.
Werner, J.; Silverman, G.; Rosenberg, F.
Abstracts of the Annual Meeting of the American Society for Microbiology 78, 187 (1978) [En] [NARADCOM, Natick, Massachusetts, USA]

Strains A100, which secretes enterotoxin A (SEA), and S6, which secretes enterotoxin B (SEB) and SEA, were grown aerobically on 4% NZ amine-type A agar at 20°, 25°, 30°, 37°, 40°, 42° or 45° C. Toxins were continuously produced and diffused from colonies which continued to expand even after viable counts became constant. Assays were conducted on concentric agar plugs and toxins were quantitated by either single gel diffusion or radioimmunoassay. Productivities (change in toxin level/10^{-7} colony forming units (CFU) h) for toxin synthesis on gels were comparable to those obtained previously from shake flask cultures, although the total amount of toxins produced was lower. Strain S6 had an optimum of 37° C for growth and toxin secretion. Approx. 10^7 CFU were required to produce detectable (1 ng) SEA or SEB, and a total of 8×10^4 ng SEB was produced at 37° and 40° C compared to 2×10^3 ng at 20° C. Productivity of SEB at 37° C was twice that at 40° C and 100× that at 20° C. Only 8–170 ng of SEA from S6 was secreted over the range of 20–40° C but both toxins secreted at comparable rates. Strain A100 secreted SEA optimally at 40° C (2×10^3 ng) and 10^7 CFU were required to produce 1–10 ng. Unlike a broth culture, the pH of the colonies for both strains rose from 6.9 to 8.0 without any initial drop due to carbohydrate metabolism. While diffusion lowers toxin concn. at >20° C, sufficient toxins are produced to cause emesis. AS

35

Sporulation and toxin production by Clostridium botulinum type G.
Solomon, H. M.; Kauter, D. A.
Abstracts of the Annual Meeting of the American Society for Microbiology 78, 192 (1978) [En] [FDA, Washington, DC, USA]

A comparative study was conducted to determine the optimum conditions for sporulation and toxin production by Clostridium botulinum type G, strain 89. 1 solid and 4 liquid media were compared for their ability to promote sporulation. They were incubated at 35° C for 12 days, 30° C for 16 days or 26° C for 21 days. Spores were harvested by centrifugation, washed 3× and concentrated 35×, then counted by the MPN procedure. Spores grown on the solid medium at 35° C gave higher counts than those grown in the liquid media. Toxin production was studied in 8 media at 35°, 30° and 26° C over a 24-day period with samplings every 2–3 days. 3 of the media contained trypsin and 5 were trypsinized after growth. Toxin titres were determined by intraperitoneal injection of mice. Higher toxin titres were obtained in media containing trypsin, incubated at 30° or 26° C. AS

36

Laboratory aspects of infant botulism in California.
Midura, T.; Arnon, S.; Chin, J.
Abstracts of the Annual Meeting of the American Society for Microbiology 78, 25 (1978) [En] [California State Health Dep., Berkeley, California, USA]

Botulism is generally regarded as an illness which results from ingestion of preformed toxin produced by Clostridium botulinum. Infant botulism is the newly-recognized form of the disease in which illness is believed to result from the production of toxin in the infant's intestines. Since its recognition as a distinct clinical entity in 1976, 37 cases of >50 documented ones have been recognized in California alone. All infants were <6 months old, were the only family member ill, and lived in different areas in California. None of the many foods or drugs tested contained preformed toxin; however, C. botulinum was isolated from several honey specimens. Stools from family members and from age-matched control infants did not contain toxin. Studies to date have identified no external source of preformed toxin for these cases, and indicate toxin production in vivo. Surveillance is continuing to determine the public health significance of this newly-recognized disease syndrome. AS

37

Detection of coagulase positive staphylococci in dried milk (reference method).
International Dairy Federation
IDF [International Dairy Federation] Standard 60A: 1978 4pp. (1978) [6 ref. En, Fr] [Square Vergote 41, 1040 Brussels, Belgium]

This standard, derived from procedures recommended by the International Commission on Microbiological Specifications for Foods was first published in 1971 [FSTA (1973) 5 4U246]. This new version includes a few amendments relating to the procedure and interpretation of results. The amendments were approved by Commission E at the IDF Sessions in Quebec City in 1976 in the light of paper E-Doc 75 [International Dairy Federation Memento 1977]. ADL

38

Milk and milk products – standard method for the detection of thermonuclease produced by coagulase positive staphylococci in milk and milk products.
International Dairy Federation

IDF [International Dairy Federation] Standard 83:1978 (Provisional) 3pp. (1978) [En] [Square Vergote 41, 1040 Brussels, Belgium]

This provisional international standard, which may be modified or nullified in the light of subsequent experience, specifies a method for detection of heat-stable DNAase (thermonuclease) produced by staphylococci, as an indication of hazardous staphylococcal growth presenting a risk of enterotoxins. Milk, reconstituted dried milk or homogenized milk products are adjusted to pH 4.5 and centrifuged. The supernatant is precipitated with trichloroacetic acid. The precipitate is adjusted to pH 8.5 and tris-buffer is added. The solution is then heated in a boiling water bath for 15 min and tested for thermonuclease activity on toluidine blue-O-DNA agar, which changes from blue to pink when thermonuclease breaks down the DNA. The diam. of the zone of nuclease activity is linearly related to the logarithm of the enzyme concn. Positive results should be confirmed by an enterotoxin test and examination for Staphylococcus aureus. A diagram, with explanatory notes, shows 3 procedures which may be used alternatively or in combination for the detection and identification of S. aureus and/or nucleases and enterotoxins. ADL

39

Prevalence of enterotoxigenicity in human and non-human isolates of Yersinia enterocolitica.

Pai, C. H.; Mors, V.; Toma, S.

Abstracts of the Annual Meeting of the American Society for Microbiology 78, 278 (1978) [En] [McGill Univ.-Montreal Children's Hospital Res. Inst., Montreal, Canada]

A total of 220 cultures of Y. enterocolitica isolated from humans (121), animals (26), food products (49) and water specimens (24) was examined for heat-labile (LT) and heat-stable (ST) enterotoxin using the Y1 adrenal cell and infant mouse assay systems. All were negative for LT, whereas 142 were positive for ST. Prevalence of ST production was analysed with regard to the source of isolation, serotype, biotype, and other biochemical reactions of the isolate. 33% and 17% of food and water isolates were as frequently enterotoxigenic as those isolated from faecal specimens. ST production was more prevalent among strains belonging to those serotypes (0:3; 5,27; 6,30; 8; 9) that are frequently isolated from human infections than in strains of other serotypes. The most significant difference was observed within the groups that differed only in rhamnose reaction; only 13% rhamnose-positive strains produced enterotoxin compared to 85% rhamnose-negative cultures. AS

40

Purification of staphylococcal enterotoxin A and B by affinity chromatography.

Kuo, J. K.; Genigeorgis, C.

Abstracts of the Annual Meeting of the American Society for Microbiology 78, 194 (1978) [En] [US Army Natick Res. & Development Command, Natick, Massachusetts 01760, USA]

The principle of affinity chromatography was applied to the purification of staphylococcal enterotoxin A and B. Specific antibody γ-immunoglobulin, IgG, was enzymically fragmented into $F(ab')_2$ fragments and Fc portion. The resulting $F(ab')_2$ fragments were separated by Sephadex G-200 column and used for conjugating to Sepharose-4B by cyanogen bromide. The antibody-conjugated Sepharose was used to purify the specific enterotoxin from broth in 1 step. Electrophoresis on 5% acrylamide gel showed only 1 band. The fact that the column can be regenerated makes the method promising for large scale purification of staphylococcal enterotoxins. AS

41

Diseases transmitted by foods (a classification and summary). [Book]

Bryan, F. L.

63pp. (1978) [190 ref. En] Atlanta, Georgia 30333, USA

This booklet on diseases transmitted by foods comprises tables for classification of food-borne diseases and organisms involved and summaries of their effects on man, sources, foods involved and control measures. Diseases covered are: Bacterial diseases (pp. 2–10); Viral and rickettsial diseases (pp. 11–13); Parasitic diseases (pp. 14–21); Fungal diseases (pp. 22–26); Plant toxicants and toxins (pp. 27–33); Toxic animals (pp. 34–40); and Poisonous chemicals (pp. 41–50). A list of references (pp. 51–60), and a 3-pp. disease index are also given. SP

42

Evaluation of staphylococcal thermonuclease (TNase) assay as a means of screening foods for growth of staphylococci and possible enterotoxin production.

Park, C. E.; El-Derea, H. B.; Rayman, M. K.

Canadian Journal of Microbiology 24 (10) 1135–1139 (1978) [15 ref. En, fr] [Food Directorate, Health Protection Branch, Health and Welfare Canada, Ottawa, Ontario K1A 0L2, Canada]

An evaluation was made of the thermonuclease (TNase) assay of Tatini et al. [see FSTA (1976) 8 10C477] for screening foods for staphylococcal enterotoxins. Samples of food naturally contaminated with Staphylococcus aureus (poultry and meat products Cheddar cheese and sandwich fillings), or artificially contaminated with Staph. aureus (low acid foods: fish, poultry, eggs, meat, dairy products, spaghetti dough; high acid foods: potato salad, salad dressing, mayonnaise, sandwich spread, plain yoghurt and mustard) were analysed for enterotoxin and TNase. With the exception of egg, all naturally contaminated foods containing enterotoxin were also positive for TNase. In artificially contaminated foods, TNase was detected in all samples except the boiled eggs (which contained enterotoxin) and the high acid foods in which growth of Staph. aureus was suppressed. With the exception of ground beef, good recoveries of added TNase were obtained from meat and poultry products, cheese, dried whole or skim-milk, plain yoghurt, sour cream and ice cream. Lower recoveries were obtained from dried whey powder and pasta, and no TNase could be recovered from fruit yoghurt or boiled egg white. MEG

43

Factors that contribute to outbreaks of foodborne disease.
Bryan, F. L.
Journal of Food Protection 41 (10) 816–827 (1978) [29 ref. En] [US Dep. of Health, Education & Welfare, Public Health Service, Cent. for Disease Control, Atlanta, Georgia 30333, USA]

Factors that contributed to foodborne outbreaks reported in the USA from 1973 to 1976 are identified and categorized by disease and by locale in which incriminated foods were mishandled. Data from the same year are tallied separately and combined with data from the years 1961–1972. Inadequate cooling was associated with most foodborne outbreaks, with many bacterial foodborne diseases (such as salmonellosis, staphylococcal food poisoning and Clostridium perfringens gastroenteritis), and frequently with outbreaks that originated from foods prepared in food service establishments and homes. Inadequate cooling practices were usually either failure to refrigerate cooked foods or the storing of foods in large stock pots or other large containers that were refrigerated. Other important factors that contributed to foodborne outbreaks were the lapse of ≥1 day between preparing and serving (coupled with inadequate refrigeration or hot-holding during this time), handling of cooked foods by infected persons, inadequate cooking or other thermal processing, inadequately high temp. during hot storage, inadequately high reheating temp., inadequate cleaning of kitchen or processing equipment, ingestion of contaminated raw food or ingredient, and cross contamination. The frequency of involvements of the factors that contributed to outbreaks in England and Wales was quite similar. The principal factors that contributed to staphylococcal food poisoning were inadequate cooling practices, infected person manipulating cooked food, and lapse of ≥1 day between preparing and serving. The principal factors that contributed to C. perfringens gastroenteritis were inadequate cooling practices, lapse of ≥1 day between preparing and serving, and inadequately high temp. during hot-holding and reheating. The principal factors that contributed to salmonellosis were inadequate cooling practices, contaminated raw ingredients, inadequate cooking or thermal processing, and cross-contamination. AS

44

Foodborne hazards of microbial origin. [Lecture]
Foster, E. M.
Federation Proceedings 37 (12) 2577–2581 (1978) [17 ref. En] [Food Res. Inst., University of Wisconsin 53706, USA]

The occurrence of bacterial agents in food and the food poisoning symptoms they produce in humans are discussed with regard to Clostridium botulinum, Staphylococcus aureus, Salmonella and other Gram-negative bacteria, C. perfringens and non-bacterial agents such as Trichinella spiralis. [See FSTA (1979) 11 3C144.] SP

45

[Methods in food toxicology.]
Sanz Battera, F.; Martin Rodilla, J.
Alimentaria No. 96, 17–21 (1978) [12 ref. Es] [Cent. Nacional de Alimentacion y Nutr., Spain]

This review-type article presents guidelines on biological assessment of toxicity in acute and longer-term experiments, and mentions extrapolation to man and use of biochemical tests. SKK

46

Release of enterotoxin A and thermonuclease from growing and non-growing cells of Staphylococcus aureus.
Niskanen, A.
Journal of Food Safety 1 (2) 119–128 (1977) [18 ref. En] [Tech. Res. Cent. of Finland, Food Res. Lab., Biologink, 1, SF-02150 Espoo 15, Finland]

Enterotoxin A and thermonuclease were produced by Staphylococcus aureus cell populations in all growth phases. Synthesis of enterotoxin was more rapid than that of thermonuclease early in the exponential phase, whereas later in the exponential phase the thermonuclease synthesis was more rapid than that of enterotoxin. The optimum temp. for enterotoxin production was 42° C, while that for thermonuclease production was in the range 27–33° C. Small amounts of enterotoxin and thermonuclease were released at temp. ≤45° C. During heat treatment of staphylococcal cells, enterotoxin production was not observed at temp. in excess of those permitting growth, although small amounts of thermonuclease were produced. Intracellular enterotoxin was not detected after disintegration of cells under pressure at −30° C. Enterotoxin at detectable concn. was not bound to the cell membranes. All the results obtained indicate that the synthesis of enterotoxin by S. aureus is intimately associated with cell growth. AS

47

A review of z and F values used to ensure the safety of low-acid canned food. [Lecture]
Pflug, I. J.; Odlaug, T. E.
Food Technology 32 (6) 63–70 (1978) [34 ref. En] [Dep. of Food Sci. & Nutr., Univ. of Minnesota, St. Paul, Minnesota 55108, USA]

An introductory section discusses the problem of producing low-acid canned foods which are both bacteriologically safe and of a high quality; the necessity of eliminating Clostridium botulinum toxin during the thermal processing of such foods; and the incidence of outbreaks of botulism caused by home-canned and commercially canned foods in the USA since 1899. Use of the wrong process for the product, failure to achieve the scheduled process, and post-process contamination are the chief causes of botulism from commercially canned foods. The authors then present extensive evidence to support their belief that a process using an F_{250} value of 3.0 min and a z value of 18° F is a realistic min. botulinum cook for low-acid foods; the above values have been standard practice for

>40 yr. The evidence, accumulated from previously published studies, is presented under the following headings: designing the process (determining the F value, adding safety factors); effect of temp. measurement; the z value; determining the z value; and public health requirements. [See FSTA (1979) 11 4E157.] JA

48

Toxin production by Clostridium botulinum in pasteurized, shelf-stable cheese spreads.
Kautter, D. A.; Lilly, T., Jr.; Lynt, R. K.
Abstracts of the Annual Meeting of the American Society for Microbiology **78,** 192 (1978) [En] [FDA, Washington, DC, USA]

5 nonrefrigerated, pasteurized cheese spreads, considered shelf-stable, were studied for their ability to support outgrowth and toxin production by Clostridium botulinum types A and B. The purpose was to determine whether these products should be treated as low acid canned foods under the FDA Good Manufacturing Practice Regulations. The choice of spreads was based on pH and a_w. The 5 spreads selected were Cheese with Bacon, Cheez Whiz, Limburger, Old English, and Roka Blue. The pH ranged from 5.05 to 6.32 and a_w from 0.930 to 0.953. 50 jars of each cheese received 1000–1700 spores/g of a mixture of 5 types A and 5 types B strains in 0.1 ml water. The inoculum was delivered through a small hole punctured in the lid, the sample was mixed with a needle, and the hole was immediately sealed. Following incubation at 35° C, 48 jars of Cheese with Bacon (pH 5.70–5.73, a_w 0.936–0.941) became toxic. The 1st positive results occurred in 50 days. 46 jars of Limburger (pH 6.26–6.32, a_w 0.953) became toxic, starting at 83 days. No other cheese samples became toxic within 175 days.

49

Growth and production of enterotoxin by Staphylococcus aureus S-6 in soy proteins and soy-supplemented beef and pork sausage.
Craven, S. E.; Blankenship, L. C.; Mercuri, A. J.
Journal of Food Protection **41** (10) 794–797 (1978) [12 ref. En] [Richard B. Russell Agric. Res. Cent., Sci. & Education Admin., USDA, PO Box 5677, Athens, Georgia 30604, USA]

The effect of 3 commercial soy proteins on growth and production of enterotoxin by Staphylococcus aureus S-6 was determined. Sterile isolated soy protein (ISP), soy protein concentrate (SPC), and textured soy protein (TSP) were adjusted to 20% protein by diluting with sterile nutrient medium, inoculated with S. aureus S-6 and incubated at 37° C. Generation times of S. aureus S-6 in ISP, SPC, and TSP were 41, 38, and 33 min, resp. At 48 h, 8.4–8.5 log organisms/g were found in the soy products, and staphylococcal enterotoxin A (SEA) and staphylococcal enterotoxin B (SEB) were produced. Each of the 3 hydrated soy protein products was added separately to ground beef or pork sausage to attain 20% (w/w) and cooked to 71° C. Each product was then inoculated and incubated at 37° C. Generation times of S. aureus S-6 did not differ significantly for any beef-soy or pork-soy samples compared with beef or pork sausage controls. Production of SEB (12–72 h) was similar in most beef-soy and pork-soy samples compared to controls, but was significantly lower in the beef-SPC product and beef-TSP and significantly higher in pork-ISP. Small quantities of SEA were produced in beef, beef-soy, pork, and pork-soy samples. Possibly, reduction of enterotoxin production in some meat-soy samples was due to outgrowth and competition by spore contaminants of the soy proteins that survived cooking. Production of SEB in all beef-soy and beef control samples was not significantly different when raw samples were autoclaved before inoculation. AS

50

[Natural and other toxic materials in food.]
Ammon, R.
Elelmezesi Ipar **32** (9) 328–335 (1978) [Hu, en, de, ru] [Univ. des Saarlandes Physiol.-Chem. Inst., 6650 Homburg, Federal Republic of Germany]

Aspects considered in this discussion of toxic materials in food include: pollen-derived toxic materials in honey; poisonous fungi; cyanides; tetrodotoxin in fugu fish; dinoflagellate toxins in shellfish; Clostridium botulinum toxin; staphylococcal toxin; mycotoxins; monoamine oxidase inhibitors and their interaction with dietary amines; allergens; F; As; Pb; Hg; Cd; DDT; and biphenyl. AJDW

51

Food poisoning and food hygiene. [Book]
Hobbs, B. C.; Gilbert, R. J.
Ed. 4, viii + 366pp. ISBN 0-7131-4313-4 (1978) [45 ref. En] London, UK; Edward Arnold (Publishers) Ltd. Price £4.50 (paperback) [Central Public Health Lab., London, UK]

The aim of this book is to bring essential facts about food poisoning and its prevention to the attention of everyone engaged in food processing. This revised 4th edition [see FSTA (1975) 7 9C307 for 3rd edition] contains 2 parts: Food poisoning and food-borne infection (pp. 1–138) and Food hygiene in the prevention of food poisoning (pp. 141–296). Individual chapters are: Introduction (pp. 1–14); Elementary bacteriology (pp. 15–24); Bacterial and other microbial causes of food poisoning (pp. 25–35); Reservoirs of infection and ways of spread (pp. 36–50); The vehicle of infection (pp. 51–76); Epidemiology and outbreaks of food poisoning (pp. 77–118); Ecology of microorganisms in food (pp. 119–127); Food-borne infection (pp. 128–138); Personal hygiene of the food handler (pp. 145–153); Storage and preservation (pp. 154–163); Preparation and cooking (pp. 164–176); Retail sale and factories (pp. 177–188); Cleaning methods (pp. 189–210); Sterilization and disinfection (pp. 211–219); Kitchen design and equipment (pp. 220–250); Control of infestation (pp. 251–262); Legislation (pp. 263–284); and Education (pp. 285–296). The appendices cover: suggested lecture material (pp. 297–327); suggestions for travelling and camping (pp. 328–332); A questionnaire for food poisoning outbreaks (p. 333); and a bibliography (pp. 334–336). A 30-pp. index is included. AL

52

Natural toxic substances in food. [Review]
Somogyi, J. C.
World Review of Nutrition and Dietetics 29, 42–59 (1978) [60 ref. En] [Inst. for Nutr. Res., Rüschlikon, Zurich, Switzerland]

This review paper is restricted to certain toxic components of food, mainly of vegetable origin, including some of the naturally occurring antivitamins. It does not include substances which are produced either by bacteria, e.g. the toxin of botulism, the enterotoxin of staphylococci, or by yeasts, such as various mycotoxins. Favism, lathyrism and only very briefly the interrelation between biogenic amines in foods (e.g. tyramine in cheeses) and the intake of certain tranquilizers are discussed, and a more detailed account is given of the effects of some antivitamins, especially of antithiamines occurring in habitual foods and beverages. DMK

53

Effect of sorbic acid and sodium nitrite on Clostridium botulinum outgrowth and toxin production in canned comminuted pork.
Ivey, F. J.; Robach, M. C.
Journal of Food Science 43 (6) 1782–1785 (1978) [6 ref. En] [Monsanto Co., 800 N. Lindbergh Boulevard, St. Louis, Missouri 63166, USA]

Experiments to determine the effect of sorbic acid alone and in combination with low nitrite and phosphate on botulinal toxin production in inoculated perishable, canned, comminuted, cured pork were conducted. 48 test lots of product were inoculated with approx. 100 spores/g of a mixture of 10 strains each of type A and B Clostridium botulinum. 25 cans of each test lot were incubated at 27° C for ≤110 days. The time of swelling was recorded for each can and the first 10 swells/test lot were tested for toxin. Multiple regression analysis of the time to first swell showed nitrite concn. had a significant linear effect on delaying outgrowth and toxin production of C. botulinum. Sorbic acid concn. was also significantly related to inhibition but through the 4th power of sorbic acid concn. The use of either sodium acid pyrophosphate or sodium hexametaphosphate was synergistic with sorbic acid as indicated by their statistically significant positive interactions. Several test lots containing 0.2% sorbic acid and either phosphate had no toxic swells after 110 days of incubation with or without 50 p.p.m. $NaNO_2$. These data indicate that sorbic acid may be a potential alternative preservative to high levels of nitrite in canned, comminuted pork products. IFT

54

Methods for detection of bacteria responsible for food poisoning. IV. Isolation and identification of Clostridium welchii, Clostridium botulinum and Bacillus cereus and enumeration of Clostridium welchii and Bacillus cereus. (First revision).
India, Indian Standards Institution
Indian Standard IS:5887 (Part IV)-1976, 13pp. (1977) [En] [Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002, India]

The Nagler reaction for C. welchii toxin is described, as are in vivo tests for C. botulinum toxin and isolation of toxin from foods. 8 tests for identification of B. cereus are described as are enumeration procedures for C. welchii on blood agar and egg-yolk medium and for B. cereus on phenol red/egg yolk/polymyxin agar. [See preceding abstr. for part III.] DIH

55

Enterotoxin formation in foods by Clostridium perfringens type A.
Naik, H. S.; Duncan, C. L.
Journal of Food Safety 1 (1) 7–18 (1977) [13 ref. En] [Dep. of Food Microbiol. & Toxicology, Food Res. Inst., Univ. of Wisconsin, Madison, Wisconsin 53706, USA]

Growth, sporulation and enterotoxin formation in various foods inoculated with a Clostridium perfringens type A enterotoxin-producing strain were studied. Good vegetative growth, 10^7–10^8 cells/g, was obtained after 4 h of anaerobic growth and remained almost the same throughout the 20–24 h observation in most of the foods. A gradual increase in spore count to the level of 10^4–10^5/g was observed with an increase in the incubation time. Enterotoxin was detected in moist cooked chuck roast, ground beef and turkey as well as in moist cooked and dry roasted chicken at levels ≥ 0.125 µg/g. The earliest time at which enterotoxin was detected was after 10 h of anaerobic growth in moist cooked turkey at 37° C. Although growth and some sporulation occurred, enterotoxin was not detected in dry roasted beef or turkey with or without gravy, or in moist cooked pork or lamb. Poor growth and sporulation were also obtained with chicken broth, chicken gravy and beef gravy. In moist cooked turkey that had been temp. abused for 6 h at 37° C, held cold for 15 h and reheated to 37° C, toxin could be detected after only 5 h of holding at 37° C. The ability of certain foods to support sporulation and enterotoxin formation indicates that such preformed enterotoxin may contribute to early onset of symptoms in some cases of C. perfringens food poisoning. AS

56

Botulogenic properties of vegetables with special reference to the molecular size of the toxin in them.
Sugii, S.; Sakaguchi, G.
Journal of Food Safety 1 (1) 53–65 (1977) [27 ref. En] [Dep. of Vet. Sci., Coll. of Agric., Univ. of Osaka Prefecture, Sakai-shi, Osaka 591, Japan]

The molecular sizes of Clostridium botulinum type A, B, E, and F toxins produced in string beans, mushrooms, tuna fish and pork were determined to provide an explanation for the high botulogenic properties of vegetables. Type A and B organisms produced the orally more toxic 16S and 19S molecular-sized toxins in vegetables, whereas they produced the orally less toxic 12S and only rarely some 16S toxin in tuna fish and pork. Type E and F organisms produced only 12S toxin in any food or culture medium, but addition of glucose seemed essential for appreciable toxin production. It appeared that the molecular sizes of type A and B toxins transform depending upon the content of Fe and Mn salts in foods. AS

57

[Studies on 114 cases of food poisoning.]
Billon, J.; Perpezat, A.; Charrier, M.
Medecine et Nutrition 13 (4) 277–280 (1977) [Fr, en] [Lab. Cent. d'Hygiene Alimentaire, 43, Rue de Dantzig, 75015 Paris, France]

Studies were conducted on 114 cases of food poisoning in various regions of France in 1974 and 1975. The cause was determined in 56 cases: sulphite-reducing anaerobic bacteria (Clostridium perfringens), 16 cases; staphylococci, 13 cases; salmonellae, 9 cases; Clostridium botulinum toxin, 4 cases; high aerobic mesophilic count (pathogenic organisms not identified), 6 cases; moulds, 3 cases; and high levels of histamine and other proteolysis products, 5 cases. Overall, 21 of these cases were of domestic and 35 of institutional origin. Studies on the food responsible for poisoning gave the following results: cured meat products, sausages, etc., 20 cases; cooked dishes, 17 cases; raw meat, 6 cases; fishery products, 5 cases; baked confectionery, 4 cases; milk and dairy products, 3 cases; and eggs and egg products, 1 case. No cases of food poisoning attributable to canned foods were recorded. AJDW

58

[Enterococci as the cause of food-borne infection or intoxication.] [Review]
Rasch, B.
Norsk Veterinaertidsskrift 90 (5) 321–327 (1978) [22 ref. No] [Norges Veterinaerhogskole Inst. for Naeringsmiddelhygiene, Oslo 1, Norway]

Aspects considered in this review include: characteristics of enterococci; reported cases of food-borne infection with enterococci; literature data concerning numerous outbreaks of food-borne intoxication caused by various foods contaminated with enterococci; symptoms of food poisoning caused by enterococci; laboratory studies (on humans and animals) with pure cultures of enterococci; and differential diagnosis of food poisoning caused by enterococci. AJDW

59

The fate of enterotoxigenic bacteria inoculated onto Chinese barbecued foods.
Stiles, M. E.; Ng, L.
Canadian Journal of Public Health 68 (5) 389–394 (1977) [18 ref. En, fr] [School of Household Economics, Univ. of Alberta, Edmonton, Alberta, Canada]

Enterotoxigenic bacteria inoculated at low concn. (3×10^1–8×10^3/g) onto Chinese barbecued foods had a longer lag phase at 30°C than the same organisms inoculated onto commercially prepared rotisserie chickens. Although the Chinese barbecued food appeared to delay the growth of some of the enteropathogenic organisms, growth had usually commenced after 5–8 h incubation at 30°C, and populations of 10^7–10^8 cells/g were achieved. The results indicated that Chinese barbecued products require storage outside of the temp. 'danger zone' (4.4–60°C), in accordance with Canadian Food & Drug regulations, to prevent growth of these potentially pathogenic bacteria. AS

60

[Food-borne illnesses of microbial origin.]
Ayres, J. C.
Tecnologia de Alimentos 12 (3) 101–103 (1977) [Es, en] [Univ. of Athens, Georgia, USA]

Among food-borne illnesses, the major ones because of their frequency are salmonellosis, shigellosis, amoebiasis, and staphylococcal and Clostridium perfringens food poisoning. The microbiological, clinical and epidemiological aspects of each, and the conditions under which they develop in practice, are described. Brief descriptions are also given of botulism, leptospirosis, and B. cereus and V. parahaemolyticus food poisoning, and of histamine poisoning from consumption of inadequately preserved fish of the Scombroidiae group. AS

61

[Distribution of enterotoxigenic staphylococci in rats (Rattus norvegicus) and biological properties of isolates.]
Mori, M.; Kato, E.; Hamada, S.
Japanese Journal of Bacteriology [Nihon Saikingaku Zasshi] 32 (3) 493–499 (1977) [25 ref. Ja, en] [Kanagawa Prefectural Public Health Lab., Yokohama, Japan]

The relationship between staphylococcal food poisoning and rats was studied by examining the distribution of enterotoxigenic strains of Staphylococcus aureus on (i) urban rats and (ii) rats from uninhabited islands. Enterotoxigenic stahphylococci were found on 3.6% of (i) and 2.9% of (ii) rats. 14 strains were isolated from (i) rats, all of which produced enterotoxin type A. Distribution of strains on (ii) rats, and further properties of isolates are also given. [From En summ.] DIH

62

[Distribution of enterotoxigenic staphylococci in healthy food handlers and biological properties of isolates.]
Mori, M.; Kato, E.; Hamada, S.
Japanese Journal of Bacteriology [Nihon Saikingaku Zasshi] 32 (3) 501–508 (1977) [18 ref. Ja, en] [Kanagawa Prefectural Public Health Lab., Yokohama, Japan]

400 food handlers who worked for a producer of packed lunches in Kanagawa Prefecture were examined for enterotoxigenic staphylococci in the 4 seasons of 1 yr. 22% of subjects carried enterotoxigenic strains of Staphylococcus aureus and a total of 135 such strains was found. Enterotoxins were produced by the following numbers of strains: type A 16, B 9, C 35, D 57, A + B 3, A + C 2, B + D 8, A + C + D 5. No strains producing enterotoxin type E were found. Almost all enterotoxigenic strains produced haemolysin, a yellow pigment, lipase and egg-yolk factor; some were resistant to antibiotics. Presence of enterotoxigenic strains of staphylococci on healthy food handlers is an important cause of food poisoning. [From En summ; see also preceding abstr.] DIH

63

Heat resistance of nonproteolytic Clostridium botulinum type F in phosphate buffer and crabmeat.
Lynt, R. K.; Kautter, D. A.; Solomon, H. M.

Journal of Food Science 44 (1) 108–111 (1979) [20 ref. En] [Div. of Microbiol., Food & Drug Admin., Washington, DC 20204, USA]

The heat resistance of nonproteolytic C. botulinum type F in 0.067M phosphate buffer and crabmeat was studied by the thermal death time (TDT) tube method. Replicate experiments at the same temp. (from 160 to 185° F) were combined for TDT curves and calculation of decimal reduction times (D). D values in buffer ranged from 42.41 min for strain 202 at 160° F to 0.25 min for strain 190 at 180° F, similar to those of type E. Slopes of TDT curves were steeper for type F in phosphate buffer (z = 11.25, 10.4 and 14.75° F) than those reported for type E. Crabmeat protected spores of strain 202, with food/phosphate factors ranging from approx. 2 to 4. IFT

64

Foodborne disease in Canada – 1975 annual summary.

Todd, E. C. D.

Journal of Food Protection 41 (11) 910–918 (1978) [4 ref. En] [Bureau of Microbial Hazards, Food Directorate, Health Protection Branch, Health & Welfare Canada, Ottawa, Ontario KLA OL2, Canada]

Data on foodborne disease in Canada in 1975 were compared with data for 1974. A total of 838 incidents, comprising 710 outbreaks and 128 single cases, and involving 7106 ill persons, was recorded for 1975. The number of outbreaks increased by 89% and single cases by 129% over those reported for 1974. As in 1974, Staphylococcus aureus was responsible for more incidents (37) than any other agent. Other incidents were caused by Salmonella (25), Clostridium perfringens (12), C. botulinum (6), suspect mould and yeast (13) and suspect Streptococcus sp. (8). In both years, non-microbiological agents, mainly chemical, accounted for < ¼ of the incidents of known aetiology. 2 persons were reported to have died through foodborne disease. About 41% of incidents and 50% of cases were associated with meat and poultry. Vegetables, fruits, bakery products, sandwiches and Chinese food also played a prominent role. Mishandling of food took place mainly in food service establishments (25% of incidents) or homes (20%). > 60% of reported foodborne disease incidents occurred in Ontario. The number of incidents/ 100 000 population was highest in the Northwest Territories (10.6), Ontario (6.4) and British Columbia (4.7). Narrative reports of 5 foodborne outbreaks are presented. AS

65

[Extraction of staphylococcal enterotoxins from foods.] Versuche zur Extraktion von Staphylokokken-Enterotoxinen aus Lebensmitteln.

Sinell, H.-J.; Mentz, I.

Archiv für Lebensmittelhygiene 29 (4) 150–155 (1978) [many ref. De, en] [Inst. für Lebensmittelhygiene, Fleischhygiene & Tech., Freie Univ. Berlin, Koserstrasse 20 III, 1000 Berlin 33]

A procedure is described for purifying staphylococcal enterotoxins which omits column chromatography and its associated losses. The extracts are treated with trypsin, acid and chloroform. Model experiments showed recoveries of about 30% (vs. 10% after column chromatography); the losses were attributed mainly to chloroform precipitation. The sensitivity of the method, 5 µg/100 g, is considerably lower than the 0.1 µg/100 g required. A negative result therefore does not ensure the safety of a food sample. Nevertheless use of this method in doubtful cases is recommended. In isolated Staphylococcus cultures toxin is easily and reliably determined by the dialysis culture technique. The detection of enterotoxin in 2 samples responsible for food poisoning, i.e. enterotoxin A in chicken soup, and toxins A and C in Bierschinken is reported. RM

66

Microbial spoilage and development of food poisoning bacteria in peeled, completely cooked or partly cooked vacuum packed potatoes.

Tamminga, S. K.; Beumer, R. R.; Keijbets, M. J. H.; Kampelmacher, E. H.

Archiv für Lebensmittelhygiene 29 (6) 215–219 (1978) [13 ref. En, de] [Agric. Univ., De Dreijen 12, Wageningen, Netherlands]

Peeled potatoes were completely or partly cooked and vacuum-packed in polypropylene-nylon pouches. Some pouches were inoculated with Salmonella typhimurium, Staphylococcus aureus or Clostridium botulinum to simulate post-contamination. The pouches were stored up to 38 days at 5°, 14° and 22°C and examined periodically. No difference was found in microbial growth on completely or partly cooked potatoes. In non-inoculated potatoes a flora developed of Baciilus cereus or B. polymixa (sometimes with B. licheniformis). In inoculated potatoes S. typhimurium and Staph. aureus grew together with a 'natural' flora of B. cereus. At 22°C, all bacterial species grew to 10^7–10^8/g after 36–48 h. At 14°C, S. typhimurium reached this count after 60 h with about 10^5/g for B. cereus and Staph. aureus. At 5°C, counts after 14 days were 10^6/g for S. typhimurium, 10^4/g for Staph. aureus (and no growth of B. cereus for > 21 days). Growth of Bacillus spp. was sometimes accompanied by gas formation. Cl. botulinum toxin was detected in some inoculated pouches stored at 14° or 22°C, mostly type B but in 1 case also type A toxin. Toxin formation was not related to storage time. It was not observed after 15 days at 5°C. A max. refrigerated storage of 3 wk is recommended for vacuum-packed completely or part-cooked potatoes. RM

67

Enterotoxigenicity of staphylococcal strains isolated from milk and dairy products.

Ahmed, A. A.; Terplan, G.; Simon, E.

Archiv für Lebensmittelhygiene 29 (6) 212–214 (1978) [many ref. En, de] [Hygiene & Food Control Dep., Fac. of Vet. Med., Assiut Univ., Egypt]

A total of 75 cultures was isolated with Baird-Parker medium from 200 samples of milk and dairy products collected from Assiut city markets. These strains were tested for production of heat-stable DNA-ase, and the 57 DNA-ase positive isolates (52 of them egg-yolk positive) for enterotoxigenicity (cellophane-over-agar technique). A modified Ouchterlony technique was used for detection of enterotoxins A, B, C, D and E. It was

found that 27 strains (47.4%) were enterotoxigenic producing types A, B and E or combinations of these types. AS

68

Growth and toxicogenesis of Clostridium botulinum type E on marine molluscs at low temperatures.
Patel, H. R.; Patel, P. C.; York, G. K.
Journal of Food Science and Technology, India 15 (6) 231–235 (1978) [13 ref. En] [Dep. of Food Sci. & Tech., Univ. of California, Davis, USA]

Fresh Pacific oysters and clams were inoculated (approx. 1×10^4 spores) with 2 strains, (i) Minneapolis and (ii) 1304, of Clostridium botulinum type E. They were incubated anaerobically at 13°, 10°, 7°, 4° and 2°C and their growth pattern was studied ≤25 days and the pH, acidity and salt contents were determined ≤90 days of incubation. At higher temp. (13° and 10°C) (i) showed max. growth little earlier than (ii) but at 7°C max. growth of (i) was at 15 days compared to 24 days for (ii). No growth occurred at 2°C in (i) or (ii). During incubation for 90 days at 2–13°C the salt content was reduced, pH fell and acidity increased. After 90 days of incubation toxin production was tested by injecting intraperitoneally into white Swiss Webster mice. Both (i) and (ii) produced toxin at all incubation temp. except 2°C. Heat sterilized oysters and clams also produced toxin after 90 days of incubation at all temp. except 2°C. It is concluded that (i) is more active in growth and in toxin production than (ii). CFTRI

69

[Occurrence and detection of staphylococcal enterotoxins in foods.] Vorkommen und Nachweis von Staphylokokken-Enterotoxinen in Lebensmitteln.
Terplan, G.
Wiener Tierärztliche Monatsschrift 65 (12) 367–371 (1978) [4 ref. De] [Inst. für Hygiene & Tech. der Lebensmittel tierischen Ursprungs, Univ. München, Schellingstrasse 10, D-8000 Munich 40, Federal Republic of Germany]

This review discusses the production, occurrence and properties of staphylococcal enterotoxins in foods. Methods for prevention of staphylococcal growth include heat treatment (max. heat sensitivity at 70–80°C, prolonged heating necessary at higher temp.) and refrigerated storage. In cases of suspected Staphylococcus aureus contamination, an initial test for the presence of thermonuclease is recommended: toxin formation can be suspected after positive thermonuclease reaction (at ≥1 million staphylococci/g). Of the methods described for toxin detection, enzyme-linked immunosorbent assay (ELISA) seems to be the quickest and most sensitive (limit of detection 0.1–1.0 ng). While the supply of enzyme-labelled antigen remains insufficient, a modified double radial immunodiffusion test is recommended for routine diagnosis, with extraction, purification and concn. of the toxin according to Reiser [see FSTA (1974) 6 8C294]. RM

70

Vacuum-packaging for fresh fish . . . scaling the first hurdle.
Bannar, R.
Food Engineering International 4 (1) 56–58 (1979) [En]

Studies on vacuum/CO_2-flush packaging of fresh fish have shown that the technique introduces no toxicological hazard from Clostridium botulinum toxin. Fish inoculated with type A, B and E botulinum spores and then packaged and stored at 45–50°F did not develop toxin until well after it became unacceptable for human consumption. Further study is required to show whether the technique will extend shelf life of fresh fish. A commercial fish processor uses a vacuum/gas-flush bulk packaging technique to distribute fresh fish to customers who would not normally handle it because of the odour problems. DIH

71

Sodium nitrite and sorbic acid effects on Clostridium botulinum toxin formation in chicken frankfurter-type emulsions.
Sofos, J. N.; Busta, F. F.; Bhothipaksa, K.; Allen, C. E.
Journal of Food Science 44 (3) 668–672 (1979) [En]
[Dep. of Food Sci. & Nutr., Univ. of Minnesota, 1334 Eckles Avenue, St Paul, Minnesota 55108, USA]

C. botulinum growth and toxin production and residual nitrite depletion were studied in a mechanically deboned chicken meat (MDCM) frankfurter-type product, during 27°C temp. abuse. A series of 3 trials was conducted in order to determine the effects of $NaNO_2$ and sorbic acid on the above parameters. Low nitrite concn. (20 and 40 μg/g), did not influence C. botulinum growth and toxin production. Addition of sorbic acid (0.2%) to these nitrite levels resulted in a significant extension of the time necessary for toxin to develop. The 0.1% sorbic acid level was ineffective. Nitrite concn. of 156 μg/g doubled the time necessary for botulinal toxin production, as did 0.2% sorbic acid alone. The magnitude of toxin production delay was increased 5 fold when 156 μg/g nitrite and 0.2% sorbic acid were combined. Nitrite depletion was rapid during processing and 27°C incubation. Low residual nitrite concn. were present for a longer time in nitrite-sorbic acid combination treatments, indicating that the presence of sorbic acid may delay depletion of residual nitrite. Gas production and spoilage of the product followed the same rate of development as toxin. IFT

72

[Heat resistance of food poisoning strains of Clostridium perfringens.]
Oka, S.
Bulletin of the Japanese Society of Scientific Fisheries [Nihon Suisan Gakkai-shi] 43 (5) 577–585 (1977) [21 ref. Ja, en] [Lab. of Food Hygiene, Fac. of Fisheries, Hokkaido Univ., Hakodate, Japan]

69 food poisoning strains of C. perfringens (4 from outbreaks in the USA, 8 from England and 57 from Japan) were tested for sporulation and heat resistance on Ellner medium, Duncan medium and SEC medium. Incubation was carried out for 24 or 48 h, after which heat treatments were given (i) at 75°C for 20 min, to give a total spore count, or (ii) at 100°C for 60 min, to enumerate heat-resistant spores. The total numbers of strains showing positive growths on (a) ≥1 media and

(b) all 3 media were: 24 h, treatment (i), (a) 66, (b) 52; treatment (ii), (a) 42, (b) 0; 48 h, treatment (i), (a) 68, (b) 58; treatment (ii), (a) 49, (b) 0. No growth occurred on the Ellner medium after treatment (ii), but 31 and 38 strains grew on both the other media after 24 and 48 h, resp. [From En summ. and tables.] JRR

73

Effects of glucose, pH, and dissolved-oxygen tension on Bacillus cereus growth and permeability factor [enterotoxin] production in batch culture.
Spira, W. M.; Silverman, G. J.
Applied and Environmental Microbiology 37 (1) 109–116 (1979) [19 ref. En] [Div. of Geographic Med., Johns Hopkins Univ. School of Med., Baltimore City Hospitals, Baltimore, Maryland 21224, USA]

74

The number of enterotoxigenic Staphylococcus aureus reached in Gouda cheese made under normal acidification conditions and the amount of enterotoxin produced.
Schouwenburg-van Foeken, A. W. J. van; Stadhouders, J.; Witsenburg, W. W.
Netherlands Milk and Dairy Journal 33 (1) 49–59 (1979) [23 ref. En, nl] [Nederlands Inst. voor Zuivelonderzoek, Ede, Netherlands]

Cheeses were prepared under normal acidification conditions (all lactose utilized within 24 h) from milk inoculated with various levels of Staph. aureus. The assay method used could detect enterotoxins A, B and C at levels of 1, 2 and 0.5 µg/100 g cheese, resp. Enterotoxin was detected in all 24-h cheese samples with Staph. aureus levels $> 10^8$/g and in 1 sample with 3.3×10^7/g. Since these high levels of Staph. aureus are very seldom observed in commercial Gouda cheeses made from raw milk, it is concluded that provided that acid development is normal, the chances of contracting food poisoning from consumption of this type of cheese are small. CDP

75

Effect of salt content and pH on toxigenesis by Clostridium botulinum in caviar.
Hauschild, A. H. W.; Hilsheimer, R.
Journal of Food Protection 42 (3) 245–248 (1979) [23 ref. En] [Bureau of Microbial Hazards, Health Protection Branch, Tunney's Pasture, Ottawa, Ontario, Canada K1A OL2]

Bottled lumpfish caviar was prepared with different salt (NaCl) concn. and pH, and injected with spores of Clostridium botulinum. Under abusive storage conditions (30°C), outgrowth and toxigenesis occurred at combinations of $\leq 3.95\%$ salt in the water phase and pH ≥ 5.2, and of $\leq 4.67\%$ salt and pH ≥ 5.6. No toxin was formed at salt concn. $\geq 5.56\%$ or at pH ≤ 5.0. A survey of commercial caviar products showed that most of these had salt-pH combinations which would effectively inhibit C. botulinum at abusive temp. during storage. AS

76

Bacterial food poisoning.
Passmore, S.
Nutrition and Food Science No. 56, 7–11 (1978) [2 ref. En]

The common causes of bacterial food poisoning are reviewed, including salmonellae, Vibrio parahaemolyticus, Escherischia coli, Clostridium botulinum, Cl. welchii (perfringens). Bacillus cereus, Staphylococcus spp. and streptococci. JRR

77

Botulism.
Martin, C. R. A.
British Food Journal 80 (887) 184–186 (1978) [5 ref. En]

The topic of botulism is reviewed, including discussion of epidemiological patterns and causes, the effects of preservation procedures on the production of Clostridium botulinum toxin, and discussion of the circumstances surrounding the botulism outbreak in Birmingham, UK in 1978. JRR

78

[Causes of bacterial food poisoning. Bacillus cereus toxins.] Ursachen bakterieller Lebensmittelvergiftungen: Bacillus cereus – Toxine. [Review]
Katsaras, K.; Hildebrandt, G.
Fleischwirtschaft 58 (9) 668, 670–676, 706 (1978) [many ref. De] [Weinheimer Strasse 25 c, 1000 Berlin 33]

This review contains sections on the occurrence and isolation of B. cereus, pathogenesis of B. cereus food poisoning, in vitro toxin formation, and properties, detection (biological and serological) and purification of B. cereus toxins. RM

79

[Detection of Staphylococcus aureus in foods.] Nachweisverfahren für S. aureus in Lebensmitteln. [Lecture]
Terplan, G.; Zaadhof, K.-J.
Archiv für Lebensmittelhygiene 29 (4) 132–135 (1978) [many ref. De, en] [Univ. München, Veterinärstrasse 13, 8000 Munich 22, Federal Republic of Germany]

This lecture discusses the biology and ecology of staphylococci as a source of staphylococcal enterotoxin food poisoning, control measures, elective and selective principles for developing media for detecting S. aureus and enterotoxin, and recommended methods of detection. Direct plating on Baird-Parker medium is recommended for most foods, though atypical colonies require additional tests (coagulase and plasma agglutination tests). Pork plasma media without egg yolk can be used. For raw milks, pork plasma or blood media with 7.5% NaCl are recommended. The electivity of the liquid enrichment medium described by Giolitti and Cantoni (blackening of the medium) is unreliable and requires confirmation on a solid medium. Trypticase soy broth with 10% NaCl and perhaps pyruvate may also be used for enrichment. The coagulase test may be replaced by the rabbit or pork

plasma agglutination test, possibly after prior catalase test of suspect colonies. In case of suspected growth of S. aureus in foods the thermonuclease test is indicated. Enterotoxin assay should only be done in specialized laboratories. [See FSTA (1979) 11 10C547.] RM

80

[Serological assay of staphylococcal enterotoxins in foods.] Serologische Nachweisverfahren von Staphylokokken-Enterotoxinen in Lebensmitteln. [Lecture]
Untermann, F.
Archiv für Lebensmittelhygiene 29 (4) 136–137 (1978) [34 ref. De, en] [Landesanstalt für Veterinärmedizin & Lebensmittelhygiene, Wieskistrasse 55, 1000 Berlin 37]

Since the highly specific and sensitive assay of staphylococcal enterotoxin by radio- or enzyme immunoassay cannot be used for routine purposes, various modifications of the microslide gel double diffusion test are recommended. To achieve the required detection of 1 µg enterotoxin/100 g of food, careful extraction, purification and concn. is needed, requiring 3–7 days [see FSTA (1974) 6 8C294]. A dialysis culture technique is recommended for examining Staphylococcus aureus cultures for toxin production. [See FSTA (1979) 11 10C547.] RM

81

Experimental development of staphylococcal enterotoxin A and B in Mozzarella cheese.
Montanaro, D.; Prete, U. del; Ribera, G.
Nuovi Annali d'Igiene e Microbiologia 29 (1) 25–31 (1978) [31 ref. It, en] [Istituto di Igiene, Univ., Naples, Italy]

Mozzarella cheese was made from whole milk and inoculated with Staphylococcus aureus ATCC 14459 or FDA 243 at 10^5, 10^6 or 10^7 cells/g, and examined after 24 and 48 h at room temp. With the 1st strain, enterotoxin A was detected after 24 h with 10^6 or 10^7 inoculum, and in all samples at 0.02–0.10 µg/g after 48 h. With the 2nd strain, enterotoxin B was detected after 24 h with the 10^7 inoculum, and in all samples at 0.07–0.20 µg/g after 48 h. Staphylococcal counts of 25 or 9×10^7 cells/g were needed to produce detectable enterotoxin. The cheese contained $3–30 \times 10^6$ lactobacilli/g and had a pH of 5.2–5.3; the development of enterotoxin seems to be encouraged by the absence of a starter in this cheese. JMD

82

Effect of garlic oil or onion oil on toxin production by Clostridium botulinum in meat slurry.
Wit, J. C. de; Notermans, S.; Gorin, N.; Kampelmacher, E. H.
Journal of Food Protection 42 (3) 222–224 (1979) [9 ref. En] [Lab. for Food Microbiol. & Hygiene, Agric. Univ., Wageningen, Netherlands]

Garlic oil (or onion oil) when used in the proportion of 1500 µg/g meat slurry inhibited toxin production by Clostridium botulinum type A (strain 73A). Inhibition, however, was not complete. Toxin production by C. botulinum type B (strain RIV 1) and type E (strain RIV 2) was not inhibited. It is not recommended that these oils be used for inhibiting toxin production by C. botulinum, as meat and meat products can contain several types of Clostridium sp. and not just type A. AS

83

[Microbiological examination of meat and meat products. Detection of botulinum toxin.]
Hungary, Magyar Szabvanyugyi Hivatal
Hungarian Standard MSZ 3640/15-77, 13pp. (1977) [Hu]

84

Enterotoxigenic staphylococci in meat, other market foods and in food poisoning.
Komarov, M.; Seligmann, R.
Refuah Veterinarith 32 (3) 88–98 (1975) [12 ref. en] [Public Health Dep., Ministry of Health, Haifa, Israel]

Coagulase-positive staphylococci, isolated from 716 market foods were assayed by the micro-gel diffusion test for production of enterotoxins A, B, C and D. Staphylococcal counts were $< 10^3$/g in 34, 18 and 38% resp. of 96 raw meat, 273 minced meat and 80 heated meat samples; similar low staphylococcal counts were found in 75% of 51 samples of cakes and 16 of ice cream, in 50% of 20 ripened cheeses and in 77% of 65 samples of heat-dried noodles. Only 2 samples of minced meat contained $> 10^6$ staphylococci/g. In contrast, only 2 out of 59 samples of home-made ewes' milk cheese contained $< 10^3$ staphylococci/g and 13 contained 10^6–10^7/g. Of staphylococci isolated from cakes and ice cream, 51% were enterotoxigenic vs. 28–34% of isolated from the other food samples. Enterotoxins A and D were detected more frequently than B and C. Enterotoxigenic staphylococci were identified in 43 out of 47 outbreaks of food poisoning. Enterotoxins A, B, C, D and E were detected resp. in 26, 2, 2, 1 and 2 samples of ewes' milk cheese. MEG

85

Food poisoning and salmonella infections in England and Wales, 1973–75.
Vernon, E.
Public Health, UK 91 (5) 225–235 (1977) [29 ref. En] [Epidemiological Res. Lab., Public Health Lab. Service, Colindale Avenue, London NW9 5HT, UK]

An analysis of cases of bacterial food poisoning and salmonella infections reported to the Public Health Laboratory Service during the 3 yr 1973 to 1975 is presented. 21 428 of the 29 108 cases in which the causal organism was identified were due to salmonellas. Clostridium welchii, Staphylococcus aureus, Bacillus cereus, Vibrio parahaemolyticus and Escherichia coli were also incriminated in outbreaks. In 1973 and 1974 the number of cases was slightly above the average for the previous 10 yr; but in 1975 there was an increase of > 50% above the average, mainly in salmonella infections. Salmonella infections contributed to the deaths of 131 persons, C. welchii to that of 2 and Staph. aureus to that of one. Many of the patients were already seriously ill and most were elderly, but there were 8 deaths in children under one year of age. 632 general

outbreaks were recorded. Of these, 296 were in hospitals, schools and other institutions and 201 were associated with restaurants, hotels, receptions and parties. This distribution may in part be due to better reporting of institutional outbreaks. Of the 333 outbreaks in which the type of food was identified, 39% were associated with meat, 31% with poultry and 30% with other foods. AS

86

Recovery and detection of staphylococcal enterotoxins in foods.
Kuo, J. K. S.
Dissertation Abstracts International, B 38 (11) 5194: Order no. 78-03619, 161pp. (1978) [En] [Univ. of California, Davis, California 95616, USA]

Staphylococcal enterotoxins A, B and C can be recovered by affinity chromatography and detected by reversed passive haemagglutination (RPHA). Using the combined procedure, it was possible to detect in 39–46% of cases 0.1 μg enterotoxins A, B and C added individually to 100 g food products such as fermented meats, cheese milk and starchy foods. Interfering factors and cross reactivities observed in the use of RPHA were studied. CDP

87

Bacillus cereus in food.
Hutchinson, E. M. S.; Taplin, J.
Food Technology in Australia 30 (9) 329–333 (1978) [54 ref. En] [Microbiol. Diagnostic Unit, School of Microbiol., Univ. of Melbourne, Parkville, Victoria 3052, Australia]

Aspects of the topic considered are: incidence and pathogenicity of B. cereus; implicated foods and region of food poisoning outbreak; illness associated with B. cereus; identification and characteristics of B. cereus; difficulties encountered in its classification; and control and prevention of B. cereus poisoning. VJG

88

What constitutes an infective dose of a food poisoning organism?
Lee, A.
Food Technology in Australia 30 (9) 335, 337–338 (1978) [10 ref. En] [School of Microbiol., Univ. of New South Wales, PO Box 1, Kensington, NSW 2033, Australia]

Consideration is given to the reason infective doses of food poisoning organisms are usually high and under what circumstances a lower dose of these bacteria can be infective. This is discussed with special reference to infection with Salmonella sp. The variations in infective dose are discussed with the emphasis on the influence of host factors especially the role of the normal gastrointestinal flora in controlling microbial colonization within the gut. VJG

89

Enterotoxigenic enteric bacteria in foods and outbreaks of food-borne diseases in Sweden.
Danielsson, M.-L.; Möllby, R.; Brag, H.; Hansson, N.; Jonsson, P.; Olsson, E.; Wadström, T.
Journal of Hygiene 83 (1) 33–40 (1979) [27 ref. En] [Dep. of Food Hygiene, Coll. of Vet. Med., SUL, S-104 05 Stockholm, Sweden]

From 86 various foods (raw meat, vegetables, ready-to-eat food, dairy products, raw products, unpasteurized soft cheeses) not implicated in food poisoning, 333 strains of Escherichia coli and other lactose-fermenting Gram-negative microorganisms were isolated; a diarrhoeic virulence factor was found in only 1 strain, E. coli isolated from unpasteurized milk. 12 foods (salads containing shrimp and ham, ham and crayfish tails, cooked meats (tongue, roast beef), liver sausage; black pudding, mushrooms cooked in cream, boiled rice, home made cheese, and cream cakes) suspected to have been the cause of diarrhoeal disease were investigated; enterotoxigenic Gram-negative bacteria were isolated from 4 of the 12 foods, 2 of the enterotoxic strains were K. pneumoniae; the content of coliform bacteria ranged from 3000 to 1 000 000/g, exceeding Swedish limits for acceptable bacteriological quality in food ($< 10\,000$ 37°C and < 1000 44°C coliforms/g food). It was concluded that though Gram-negative bacteria seemed to be rare in correctly handled food, such microorganisms should not be forgotten in investigations of food poisoning. SP

90

Thermonuclease as an indicator of staphylococcal enterotoxins in food.
Tatini, S. R.
Abstracts of Papers, American Chemical Society 177 (1) AGFD 13 (1979) [En] [Dep. of Food Sci. & Nutr., Univ. of Minnesota, 1334 Eckles Ave., St. Paul, Minnesota 55108, USA]

Growth of enterotoxigenic staphylococci to $\geq 1 \times 10^6$/g or ml in foods during processing and storage could result in enterotoxins that cause food poisoning. Enumeration of staphylococci in finished products for detection of such a hazardous population would not be useful in foods processed by heating or fermentation because these conditions destroy staphylococci and not enterotoxins. Testing foods for presence of enterotoxins is rather involved, time consuming and not yet practical for routine quality control. Staphylococci produce a heat-stable nuclease (TNase) which is as heat-stable as enterotoxins and can be more easily and rapidly detected (4–6 h). Growth of enterotoxigenic staphylococci in some experimentally innoculated foods (milk, cream, cheeses, cheese whey, smoked sausage, pepperoni, thuringer, ground beef, vacuum packed bologna) resulted in detectable TNase, first at population levels of 1×10^6/ml or g and later in enterotoxins at much higher populations of $> 10^7$/g. Likewise, TNase was also detected in foods naturally contaminated with and containing $\geq 1 \times 10^6$ staphylococci/g or detectable level of enterotoxins. Therefore, TNase could serve as an indicator of enterotoxins. AS

91

Honey and other environmental risk factors for infant botulism.
Arnon, S. S.; Midura, T. F.; Damus, K.; Thompson, B.; Wood, R. M.; Chin, J.
Journal of Pediatrics 94 (2) 331–336 (1979) [25 ref. En]

[California Dep. of Health Services, 2151 Berkeley Way, Berkeley, California 94704, USA]

Infant botulism (IB) results from in vivo production of toxin by Clostridium botulinum after it has colonized the infant's gut. Attempts were made to identify risk factors and routes by which Cl. botulinum spores might reach susceptible infants. Epidemiological investigations were made of 41 cases of IB in California (25 caused by type A toxin and 16 by type B). Cl. botulinum was isolated from honey which had been fed to one patient. Therefore, honey samples were obtained from patients' homes and from shops used by their families, and also from a honey processing plant in California, and other retail outlets. Honey, other foods and environmental samples were examined for Cl. botulinum organisms and toxin. Epidemiological data were also obtained for 34 cases (18 type A, 16 type B) of IB occurring outside California. From a total of 555 samples examined, Cl. botulinum was isolated from the following: honey (9), garden soil (2), houseplant soil (1), vacuum cleaner dust (1). Preformed botulinal toxin was not found in any sample. Statistical analyses indicated that honey is significantly associated with type B IB ($P = 0.005$). Of the total 75 cases examined, 26 had been fed honey prior to the onset of IB; of the 75 patients, only 2 died. The authors conclude that honey represents a risk factor for IB and recommend that it should not be fed to children under 12 months of age. JA

92

Infant botulism and the honey connection.
Brown, L. W.
Journal of Pediatrics 94 (2) 337–338 (1979) [15 ref. En] [Dep. of Pediatrics & Neurology, St Christopher's Hospital for Children, Temple Univ. School of Med., Philadelphia, Pennsylvania 19133, USA]

This paper briefly discusses the study by Arnon et al. [see preceding abstr.] which provided evidence of a link between honey consumption and the occurrence of infant botulism (IB). Brief consideration is also given to: the distinction between IB and botulism in older people; the ubiquitious nature of Clostridium botulinum spores and their resistance to adverse conditions; the occurrence of Cl. botulinum spores in honey and beeswax; and the diagnosis and treatment of IB. JA

93

Occurrence of coagulase-positive staphylococci in Egyptian raw milk and dairy products. II. Ice cream and zabady.
El-Nockrashy, S.; Naguib, M. M.; Sabbour, M. M.; Naguib, K.
Research Bulletin, Faculty of Agriculture, Ain Shams University No. 945, 11pp. (1978) [14 ref. En, ar] [Food Tech. & Dairy Lab., Nat. Res. Cent., Dokki, Cairo, Egypt]

30 samples each of ice cream and the cultured milk zabady were examined by direct streaking on Difco S110 media, with or without prior enrichment. Using enrichment, the average counts of total staphylococci and pigmented, coagulase-positive staphylococci were for ice cream 2.38×10^6 and 8.94×10^4/ml and for zabady 2.16×10^6 and 1.93×10^5/ml resp. Enrichment enabled coagulase-positive staphylococci to be detected in 5 more samples of ice cream and 8 more of zabady, but also gave negative results for 5 ice cream and 3 zabady samples that were positive without enrichment. JMD

94

The control of the botulism hazard in hot-smoked trout and mackerel.
Cann, D. C.; Taylor, L. Y.
Journal of Food Technology 14 (2) 123–129 (1979) [18 ref. En] [Torry Res. Sta., 135 Abbey Road, Aberdeen AB9 8DG, UK]

The growth and toxin production of Clostridium botulinum types B, C, E and F in hot-smoked trout and mackerel were studied. Using whole trout naturally contaminated with Cl. botulinum type E it was established that salt was the major inhibiting factor; a min. concn. of 2.5% salt-on-water phase prevented the production of toxin for 30 days when fish were stored at 10°C. When whole and minced fish were inoculated with spores of Cl. botulinum types B, E and F at a concn. considerably higher than that found in nature (10^2/g) a min. salt concn. of 3% was required to achieve a similar effect. Further studies using trout inoculated with suspensions of a number of strains of Cl. botulinum containing both spores and vegetative cells (10^2/g) showed that fish smoked to produce a min. salt concn. of 3% had a safe shelf life of 30 days at 10°C and 1 day at 20°C. AS

95

Isoascorbate level and botulinal inhibition in perishable canned cured meat.
Tompkin, R. B.; Christiansen, L. N.; Shaparis, A. B.
Journal of Food Science 44 (4) 1147–1149 (1979) [16 ref. En] [Swift & Co., 1919 Swift Drive, Oak Brook, Illinois 60521, USA]

Isoascorbate can either enhance or decrease botulinal inhibition in inoculated perishable canned cured meat abused at 27°C. It enhances inhibition when the product is abused at the time of manufacture. It decreases inhibition if it is used in excessive levels or when the product is refrigerated before abuse. The 1st effect is due to the sequestering property of isoascorbate. The 2nd is because isoascorbate hastens the depletion rate of residual nitrite. The relative levels of residual nitrite and viable botulinal cells at time of abuse determine the degree of botulinal inhibition. Excessive levels of isoascorbate over those normally used (e.g., 200 µg/g) should be avoided in this class of product. IFT

96

Behaviour of proteolytic Clostridium botulinum types A and B near the lower temperature limits of growth.
Smelt, J. P. P. M.; Haas, H.
European Journal of Applied Microbiology and Biotechnology 5 (2) 143–154 (1978) [21 ref. En] [Unilever Res. Vlaardingen, Oliver van Noortlaan 120, Vlaardingen, Netherlands]

The behaviour of spores of Clostridium botulinum

type A and proteolytic C. botulinum type B has been studied in cooked meat medium at 10°C, 12°C, 15°C, and 20°C, using mixed cultures (9 groups of in total 41 strains) and pure cultures (41 strains). At 10°C a decrease of 1–1.5 log cycles for type B and of 2–4 log cycles for type A Clostridia was observed. Neither growth nor toxin formation could be demonstrated. At 12°C spores of some strains developed and formed toxin within 3–4 wk, whereas other strains did not develop within 7 wk. At 15°C growth and toxin formation could be observed within 1 wk, whereas at 20°C toxin was formed mostly within 2 or 3 days. Incubation at 10°C prior to incubation at 20°C seemed to have some effect on the lag time. AS

97

Influences of environmental factors on growth and production of enterotoxins by Staphylococcus aureus.
Lee, R. Y.
Dissertation Abstracts International, B 39 (2) 642: Order No. 78-13422, 210pp. (1978) [En] [Univ. of Minnesota, Minneapolis, Minnesota 55455, USA]

Effects of water activity (a_w), pH, aeration and humectant on staphylococcal growth and enterotoxin production, and effects of a_w on synthesis and release of enterotoxin were studied. In a water-restricted medium, growth of S. aureus and enterotoxin production continued to a_w 0.86. pH and a_w affected growth and toxin production individually and interacted synergistically; no enterotoxin A was detected in the medium at pH 6.0 and 0.90 a_w or pH 5.0 and a_w 0.95 or 0.90. Similar interaction was observed in a glycerol medium (a_w adjusted by adding glycerol to basic medium). Type of humectant used influenced growth and toxin production. Growth in NaCl-medium and sucrose-medium was stimulated with respect to growth in glycerol-medium or water-restricted medium. Enterotoxin production was highest in NaCl-medium and lowest (severely repressed) in sucrose-medium. At high a_w levels, only synthesis of enterotoxin was affected; at low a_w, synthesis and release were affected. Critical a_w for restriction of enterotoxin release depended on humectant used, viz. 0.95–0.90 for sucrose or glycerol-medium, and 0.92–0.88 for NaCl-medium. Other factors studied included production of heat stable nuclease and extracellular protein, and amino acid pool sizes. DIH

98

Factors affecting physical and chemical properties of alpha toxin from Clostridium perfringens.
Babajimopoulos, M. G.
Dissertation Abstracts International, B 39 (2) 641: Order No. 78-12316, 115pp. (1978) [En] [Ohio State Univ., 190 N. Oval Drive, Columbus, Ohio 43210, USA]

As C. perfringens α-toxin activity may be used as an indirect index of amount of C. perfringens present in foods, factors affecting α-toxin activity were studied. Use of haemolytic indicator plates and lecithovitellin showed that the same protein molecule was responsible for the haemolytic and phospholipolytic activities of α-toxin. α-toxin was protected against heat inactivation by high and low mol. wt. components of proteose-peptone, and also by Ca^{2+}. Heat-inactivated α-toxin was reactivated by incubation with proteose-peptone at 37°C for 24 h. Air or N_2 produced surface denaturation of α-toxin; proteose-peptone protected against this denaturation. Trypsin reduced a-toxin activity, increased heat susceptibility of α-toxin, and reduced heat protection ability of proteose-peptone. α-toxin was more susceptible to heat at low ionic strength salt solutions (0.05M) than at high ionic strength (0.2M). Purified α-toxin had a K_m of 0.1M. Significance of results for indirect quantitation of C. perfringens in foods is discussed. DIH

99

Distinction between emetic and other strains of Bacillus cereus using the API system and numerical methods.
Logan, N. A.; Capel, B. J.; Melling, J.; Berkeley, R. C. W.
FEMS Microbiology Letters 5 (5) 373–375 (1979) [14 ref. En] [Dep. of Bact., Med. School, University Walk, Bristol BS8 1TD, UK]

B. cereus causes food-borne illness associated with diarrhoea or vomiting. Presently-available methods for distinguishing emetic from diarrhoeal types are expensive and time-consuming. Numerical analysis of data from the application of API systems 20E, 50E and ZYM to a variety of isolates and collection strains showed that the emetic types formed a separate group from diarrhoeal types, the latter tending to group with other strains of B. cereus and closely-related organisms. These results are considered to form the basis of a rapid method for distinguishing between the bulk of B. cereus strains and the emetic toxin producers. BAL

100

Clostridium botulinum growth and toxin production in tomato juice containing Aspergillus gracilis.
Odlaug, T. E.; Pflug, I. J.
Applied and Environmental Microbiology 37 (3) 496–504 (1979) [20 ref. En] [Dep. of Food Sci. & Nutr., Univ. of Minnesota, St Paul, Minnesota 55108, USA]

The ability of spores of 1 type A and 1 type B strain of Clostridium botulinum to grow and produce toxin in tomato juice was investigated. The type A strain grew at pH 4.9, but not at 4.8; the type B strain grew at pH 5.1, but not at 5.0. Aspergillus gracilis was inoculated along with C. botulinum spores into pH 4.2 tomato juice; in a nonhermetic unit, a pH gradient developed under the mycelial mat, resulting in C. botulinum growth and toxin production. In a hermetic unit, mould growth was reduced, and no pH gradient was detected; however, C. botulinum growth and low levels of toxin production (< 10 50% lethal doses/ml) still occurred and were associated with the mycelial mat. Results of tests to find filterable or dialyzable growth factors were negative. It was demonstrated that for toxin production C. botulinum and the mould had to occupy the same environment. AS

101

Enterobacteriaceae, their significance for the bacteriological assessment of foods.
Brandl, E.
Bulletin, International Dairy Federation No. 108,

22–26 (1978) [6 ref. En] [Inst. für Milchhygiene & Milchtech., Vienna, Austria]

This paper first considers the different members of the Enterobacteriaceae group, the likelihood of their occurrence in food and the broad outlines of testing for them. The nature of human disease caused in particular by Salmonella spp. and Shigella is mentioned. The significance of coliform tests in relation to food quality is discussed, in particular in control of factory hygiene for milk and milk products. It is suggested that a more general test for Enterobacteriaceae would be more valuable in testing for food hygiene than a specific coliform test. JMa

102

[Presence of Staphylococcus aureus and enterotoxin in dried milk powders.]

Özalp, E.; Kaymaz, S.; Inan, T.

Ankara Universitesi Veteriner Fakultesi Dergisi 25 (1) 48–54 (1978) [15 ref. Tr, en] [Ankara Univ. Vet. Fak. Besin Kontrolu ve Teknolojisi Kürsüsü, Ankara, Turkey]

36 samples of dried milk produced in Turkey and 34 samples of foreign origin (Federal Republic of Germany, France and USA) were examined for the presence of enterotoxigenic staphylococci and enterotoxin. Of the Turkish samples, 1 contained enterotoxigenic Staphylococcus aureus and 2 contained enterotoxin, whereas none of the samples of foreign origin contained Staph. aureus or enterotoxin. Results indicate that dried milks produced in Turkey do not satisfy public health requirements. [From En summ.] MEG

103

[Enterotoxigenic staphylococci and salmonellae on Erzincan Tulum cheese.]

Özalp, E.; Kaymaz, S.; Aksehirli, E.

Ankara Universitesi Veteriner Fakultesi Dergisi 25 (1) 55–61 (1978) [22 ref. Tr, en] [Ankara Üniv. Vet. Fak. Besin Kontrolu ve Teknolojisi Kürsüsü, Ankara, Turkey]

None of 26 samples of Erzincan Tulum cheeses examined contained enterotoxigenic staphylococci or Salmonella, but 1 sample contained enterotoxin. Results indicate that there is a risk of staphylococcal food poisoning from Erzincan Tulum cheese. [From En summ.] MEG

104

[Contamination of meat with enterotoxogenic staphylococci during slaughter and processing of pigs and cattle.]

Buncic, O.; Rajkovic, N.; Peric, M.

Hrana i Ishrana 19 (11/12) 566–570 (1978) [14 ref. Sh, en] [Vet. Fak., Belgrade, Yugoslavia]

Studies on levels of contamination with enterotoxigenic staphylococci (ES) were conducted in 5 slaughterhouses in Serbia. Swab samples from skin of the 25 live pigs and 5 live cattle showed 60% and 20% resp. to be contaminated with ES. Studies on carcasses and internal organs showed positive results for 72% of pig carcasses and 54% of beef carcasses. 150 of 240 swab samples from equipment and tools were positive for ES, as were 60 of 70 swab samples from the hands of workers. Of 46 coagulase-positive staphylococci studied, 6 gave positive results for enterotoxin A, and 7 gave positive results for enterotoxin C. IN

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